2012 ANNUAL POST-REMEDIATION MAINTENANCE AND GROUNDWATER MONITORING REPORT

United Technologies Corporation
Pratt & Whitney Division
F&H Buildings
East Hartford, Connecticut

January 2013

Volume 3 of 3

Prepared for

UNITED TECHNOLOGIES CORPORATION
One Financial Plaza
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Prepared by

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An Employee Owned Company

Comm. No. 88UT136.001

Loureiro
Engineering • Construction • EH&S • Energy • Waste

January 17, 2013

State of Connecticut
Department of Energy & Environmental Protection
Remediation Division
79 Elm Street
Hartford, CT 06016-5127

Attn: Gil Richards

RE: United Technologies Corporation
Pratt & Whitney Division
Post-Remediation Maintenance and Monitoring
F&H Buildings, Pratt & Whitney East Hartford, Connecticut
LEA Comm. No. 88UT136

Dear Mr. Richards:

In accordance with Appendix B and C of the document entitled *Remedial Action Work Plan and Request for Variance Engineered Control of Polluted Soils, F&H Buildings Remediation Project,* approved by the Department of Energy and Environmental Protection (CT DEEP) on June 8, 2005, and the Modified Monitoring Program for F&H Buildings Remediation Project approved by CT DEEP on March 30, 2012, attached please find the 2012 Annual Post-Remediation Maintenance and Groundwater Monitoring Report for F&H Buildings. The maintenance and monitoring activities were initiated following the December 6, 2006 completion of remediation activities at F&H Buildings.

If you should have any questions or comments, please contact me at (860) 410-3028 or Joe Tota of United Technologies Corporation at (860) 728-6510.

Sincerely,

LOUREIRO ENGINEERING ASSOCIATES, INC.

David Fiereck, P.E., L.E.P.
Vice President

Attachment

cc: Maurice Hamel, CT DEEP
Juan Perez, EPA
Lauren Levine, UTC
Joseph Tota, UTC
John Wotus, P&W

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FIGURES

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ACRONYMS

CSM	Conceptual Site Model
CT DEEP	Connecticut Department of Energy and Environmental Protection
CT ETPH	Connecticut Extractable Total Petroleum Hydrocarbons
DQA	Data Quality Assessment
DQO	Data Quality Objective
DUE	Data Usability Evaluation
ELUR	Environmental Land Use Restriction
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
GWPC	Groundwater Protection Criteria
IDEC	Industrial/Commercial Direct Exposure Criteria
IVC	Industrial/Commercial Volatilization Criteria
LCS	Laboratory Control Sample
LEA	Loureiro Engineering Associates, Inc.
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
PMC	Pollutant Mobility Criteria
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAWP	Remedial Action Work Plan
RCP	Reasonable Confidence Protocol
RCRA	Resource Conservation and Recovery Act
RCSA	Regulations of Connecticut State Agencies
RDEC	Residential Direct Exposure Criteria
RSR	Remediation Standard Regulation
RVC	Residential Volatilization Criteria
SOP	Standard Operating Procedure
SWPC	Surface Water Protection Criteria
TCA	1,1,1-Trichloroethane
UTC	United Technologies Corporation
VC	Volatilization Criteria
VOC	Volatile Organic Compound

UNITS

mg/kg	milligrams per kilogram
mg/l	milligrams per liter
µg/l	micrograms per liter

1. INTRODUCTION

United Technologies Corporation (UTC)/Pratt & Whitney retained Loureiro Engineering Associates, Inc. (LEA) to perform the post-remediation groundwater monitoring and maintenance activities associated with the remediation of polychlorinated biphenyl (PCB) contaminated concrete and soil at areas underlying the former F&H Buildings (herein after referred to as the "Project Area") at the UTC/Pratt & Whitney manufacturing facility in East Hartford, Connecticut (herein after referred to as the "Site"). The remediation of concrete and soil underlying the Project Area was undertaken by UTC/Pratt & Whitney on a voluntary basis in accordance with the document entitled *Remedial Action Work Plan and Request for Variance Engineered Control for Polluted Soil* (RAWP), approved by the Connecticut Department of Energy and Environmental Protection (CT DEEP) on June 8, 2005. The F&H Buildings Remediation Project was completed on December 6, 2006.

The following report has been prepared in accordance with the Post-Remediation Groundwater Monitoring Plan and the Post-Remediation Maintenance and Monitoring Program, which are included as Appendix B and C, respectively, of the CT DEEP approved RAWP and the Modified Groundwater Monitoring Program approved by CT DEEP on March 30, 2012. The specific intent of the Modified Groundwater Monitoring Program is to continue to assess the effectiveness of the installed engineered control. This report presents the 2012 annual summary of post-remediation groundwater monitoring and maintenance monitoring of the engineered control.

As detailed in Section 5, no PCBs were detected in any of the groundwater samples collected in 2012. The absence of detectable concentrations of PCBs in groundwater indicates that the remediation activities performed to date have been effective in eliminating PCBs as a groundwater contaminant source.

The detected concentration of each of the constituents of concern for the Project Area was below the default, numeric Surface Water Protection Criteria (SWPC), Residential Volatilization Criteria (RVC) and Industrial Volatilization Criteria (IVC) of the Remediation Standard Regulations (RSRs) for the annual monitoring event conducted in 2012.

2. LOCATION AND SITE DESCRIPTION

The UTC/Pratt & Whitney East Hartford manufacturing facility is located at 400 Main Street in East Hartford, Connecticut. A Site Location Map is presented as Figure 2-1. The facility encompasses approximately 769-acres of contiguous land. Pratt & Whitney initiated aircraft engine manufacturing operations in East Hartford in December 1929. Current operations are conducted in an approximate four million square foot complex and include administration and management, manufacturing, testing, research and development and ancillary services. All of these activities take place in the western portion of the 769-acre property.

The Rentschler Airport and the Klondike Area occupy the eastern portion of the Site. UTC/Pratt & Whitney previously used these two areas as an airport and a storage/testing area, respectively. On the northern end of the Airport is a 75-acre portion of the Site that was given to the State of Connecticut and subsequently developed as a football stadium (Rentschler Field). The F&H Buildings Project Area is located in the northern portion of the Site and is approximately 864,000 square feet in size.

3. BACKGROUND

Several investigations have been conducted at the facility. Between June 2002 and September 2003, LEA conducted a comprehensive Phase I/Phase II/Phase III Investigation in the vicinity of F&H Buildings. This investigation was undertaken on a voluntary basis to assess the environmental issues associated with the demolition of F&H Buildings, which was conducted in 2005 and 2006. Additional information pertaining to site background and previous environmental investigations can be found in the RAWP and in the report entitled *Remedial Action Report - F&H Buildings Remediation Project* (RA Report) prepared by LEA in January 2007 and submitted to the United States Environmental Protection Agency (EPA) and the CT DEEP on February 2, 2007.

The overall remedial action objective of the activities that were conducted within the Project Area between August 2005 and December 2006 was to physically remove, via excavation and off-site disposal, concrete containing total PCB concentrations in excess of 10 milligrams per kilogram (mg/kg) and all soil containing total PCB concentrations in excess of 25 mg/kg and the installation of an engineered control over a portion of the Project Area with soil remaining with a total PCB concentration in excess of 10 mg/kg. An additional remedial objective for this project was to meet tabulated numeric criteria of the RSRs. For the areas outside of the engineered control, the additional remedial action objective was to meet the Residential Direct Exposure Criteria (RDEC) for PCBs for soils within 4-feet of the final grade, the Industrial/Commercial Direct Exposure Criteria (IDEC) for PCBs for soils within inaccessible locations and the GB Pollutant Mobility Criteria (GB PMC) for soils above the seasonal high water table.

The remedial action objectives also included the implementation of institutional controls to ensure the long-term protectiveness of the remedy. The institutional controls consist of an Environmental Land Use Restriction (ELUR) to ensure the affected area will not be used for residential purposes and to prohibit excavation of areas deemed environmentally isolated and inaccessible and insure that the engineered control will not be disturbed.

Following the excavation and construction activities, the entire Project Area was restored to be used as a storage area. As part of the restoration, an engineered control was installed within the former Hydraulic Press Area, which contained soil with a residual PCB content of greater than 10 mg/kg. The engineered control consists of a 40-mil thickness high-density polyethylene liner, which was overlain by a minimum of 18-inches of granular fill, which was overlain by a

minimum of 3-inches of process aggregate, and overlain by a minimum of 3-inches of bituminous pavement. Four permanent survey markers were placed at the four corners of the engineered control to delineate the limits of the engineered control.

Post-remediation groundwater sampling of monitoring wells installed in and immediately surrounding the Project Area was conducted on a quarterly basis from June 2007 through December 2011. On March 30, 2012, CT DEEP granted approval to modify the groundwater monitoring program for F&H Buildings (the Project Area). The modifications to the monitoring program included a reduction in the monitoring frequency from quarterly to annually and the discontinued sampling of monitoring wells FB-MW-01, FB-MW-02, HB-MW-04, HB-MW-05 and HB-MW-06. In addition, the modified program required the installation and monitoring of one additional monitoring well (HB-MW-08) immediately downgradient of the engineered control. A copy of LEA's proposed Modified Groundwater Monitoring Program and CT DEEP's approval letter is provided in Appendix A. Consequently, a total of one monitoring event was completed in September 2012. Semi-annual inspections of the engineered control have been conducted since June 2007 and were completed in 2012 during the months of March and September.

4. GROUNDWATER MONITORING

Groundwater monitoring activities were performed in accordance with subsection (f) of Section 22a-133k-3 of the RSRs. The groundwater monitoring plan detailed in Appendix B of the RAWP and Appendix R of the RA Report was designed to determine:

- the effectiveness of soil remediation in preventing further pollution of groundwater by substances from the release area;
- the effectiveness of any remediation taken to eliminate or minimize identified health or safety risks associated with such release;
- whether applicable surface-water protection criteria and volatilization criteria have been met; and
- whether any contaminant plumes emanating from the product area interfere with existing use of the groundwater for a drinking water supply or with any other existing use of the groundwater, including but not limited to industrial, agricultural or commercial uses.

In May 2007, a total of six groundwater monitoring wells (FB-MW-01, FB-MW-02, and HB-MW-04 through HB-MW-07) were installed within and around the F&H Buildings Project Area. The locations of these monitoring wells are depicted on the Site Plan included as Figure 4-1 of this report. In accordance with the modified groundwater monitoring program approved by the CT DEEP on March 30, 2012, one additional monitoring well (HB-MW-08) was installed immediately downgradient of the engineered control to continue to monitor groundwater quality in August 2012. Other modifications to the groundwater monitoring program included a reduction in the monitoring frequency from quarterly to annually and the discontinued sampling of monitoring wells FB-MW-01, FB-MW-02, HB-MW-04, HB-MW-05 and HB-MW-06. Consequently, a total of one monitoring event was completed in September 2012, which included the collection of groundwater samples from monitoring wells HB-MW-07 and HB-MW-08. Semi-annual inspections of the engineered control continued to be conducted on a semi-annual basis and were completed in March and September of 2012. The next scheduled cap inspection will be performed in March 2013 and the next scheduled groundwater monitoring event will be performed in September 2013.

4.1 Description of Well Installation and Development Activities

In accordance with the CTDEEP approved modified groundwater monitoring plan for the Project Area, one additional monitoring well, HB-MW-08, was installed immediately downgradient of the engineered control. Monitoring well HB-MW-08 was installed by LEA personnel on August 2, 2012 using direct push drilling methods in general accordance with LEA Standard Operating Procedure (SOP) ID #10007 entitled, *Installing and Developing Monitoring Wells and Piezometers*.

The direct push method consisted of using a hydraulic hammer head to push a 3.25-inch diameter core barrel to a depth determined by prior macro-core sampling methods. Once the target depth was reached, a ten foot section of 1.5-inch diameter Geoprobe® pre-packed 0.010-slot PVC screen attached to polyvinyl chloride (PVC) riser was set into the base of the borehole. The annular space around the screen was then backfilled with No. 0 silica sand to three feet above the screen. A seal of hydrated bentonite grout was then made from the top of the No. 0 sand to just below the ground surface. A flush-mounted aluminum road-box was installed on the top of the well, and a 2-foot by 2-foot concrete pad was built around the road-box. The boring log and well completion log for HB-MW-08 is provided in Appendix B.

The new monitoring well was developed on August 3, 2012 to remove fine sediment from the well, screen openings, and filter pack and to facilitate flow to the well. Development procedures included pumping and surging using a surge block and continued until the turbidity of water produced from the well was below specified criteria and until physical parameters (pH, temperature, and conductivity) stabilized. Development criteria are specified in the LEA SOP ID #10007 entitled, *Installing and Developing Monitoring Wells and Piezometers.*

Copies of the field paperwork documenting the installation of the monitoring well and well development activities are provided in Appendix C.

4.2 Description of Groundwater Monitoring Activities

In January 2012, groundwater from monitoring well HB-MW-05 was collected and re-sampled for analysis for total and hexavalent chromium to verify an elevated total chromium result that was reported during the December 2011 sampling event. In addition, groundwater samples were collected during one annual monitoring event completed in September 2012 from two groundwater monitoring wells (HB-MW-07 and HB-MW-08). Groundwater samples collected

as part of the September 2012 annual sampling event were sent under chain of custody control to Accutest Laboratories (Accutest) of Marlborough, Massachusetts and were analyzed for the following parameters: PCBs by EPA Method 8082; volatile organic compounds (VOCs) by EPA Method 8260B; Connecticut Extractable Total Petroleum Hydrocarbons (CT ETPH) by the CT DEEP approved method; and total metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc). In addition, one duplicate sample, one trip blank sample, and one equipment blank sample were analyzed. Copies of field paperwork are included as Appendix C and copies of laboratory reports are included in Appendix D of this report.

4.3 Groundwater Elevations

Depth to groundwater was measured in all seven monitoring wells on an annual basis using an electronic water level indicator. Groundwater levels were measured to the nearest 0.01 foot. Water level measurements were collected by LEA on September 6, 2012. It is noted that monitoring well HB-MW-04 was destroyed during a re-paving effort. However, the modified monitoring program does not require groundwater sampling at this location and the existing network of monitoring wells is adequate to determine groundwater flow direction across the Project Area. Groundwater-level information was used to evaluate groundwater flow directions and horizontal hydraulic gradients in the upper portion of the unconsolidated aquifer. A generalized groundwater contour map from the September 2012 monitoring event is included as Figure 4-2.

4.3 Quality Assurance and Quality Control Procedures

During the course of the 2012 post-remediation monitoring, a variety amount of information was obtained for the Project Area including analytical data for groundwater samples; field measurements; sample tracking forms; and other documentation associated with sample collection and analysis. Ensuring that the data generated during the post-remediation monitoring was of sufficient quality to meet the data quality objectives (DQOs) for the project, performance and documentation of quality assurance/quality control (QA/QC) procedures for field and office activities was essential. The following DQOs were developed for the Post-Remediation Groundwater Monitoring Program for the Site:

- Samples collected were of sufficient quality and quantity to assess the groundwater conditions at the Site.

- Data obtained were of sufficient quality and quantity to support a regulatory compliance determination.
- Data were sufficient to determine handling and disposal requirements for purged groundwater and decontamination solutions generated during the post-remediation groundwater monitoring activities.

The various types of QA/QC procedures used to ensure that the quality of data generated during the investigation would be sufficient to meet the DQOs for the project included the analysis of trip blank samples, equipment blank samples, and field duplicate samples. A detailed description of the methods employed to collect and analyze these QA/QC samples is provided in Appendix E

All data generated during 2012 post-remediation groundwater sampling were analyzed using the CT DEEP Reasonable Confidence Protocols (RCPs), which are enhanced analytical procedures based on the respective EPA or other appropriate methods. The RCPs provide specific QA/QC requirements that the laboratory must follow during analysis of environmental samples. QA/QC information provided by laboratories using the RCP methods was assessed and evaluated in accordance with the guidelines for performing Data Quality Assessments (DQAs) and Data Usability Evaluations (DUEs). A further explanation of the DQA and DUE process and a discussion of the results of the DQA and DUE are provided in Appendix E.

5. GROUNDWATER QUALITY

5.1 Summary of Analytical Data

A total of four groundwater samples (including one duplicate groundwater sample collected from monitoring well HB-MW-08) were collected in 2012. One of the four samples was collected from monitoring well HB-MW-05 in January 2012 to verify total chromium results previously reported during the December 2011 sampling event. A summary of sampling and analytical information is included as Table 5-1. A summary of constituents detected in groundwater is provided as Table 5-2. The following is a summary of analytical results for each constituent of concern.

Polychlorinated Biphenyls: No PCBs were detected in the three groundwater samples that were collected for analysis in 2012.

Volatile Organic Compounds: Only one VOC, 1,1,1-trichloroethane (TCA), was reported in the groundwater samples collected from monitoring well HB-MW-08 and its duplicate at concentrations of 4.8 micrograms per liter (µg/l) and 4.9 µg/l, respectively.

Total Petroleum Hydrocarbons: CT ETPH was reported in groundwater collected from monitoring wells HB-MW-07 and HB-MW-08 at concentrations of 0.0830 milligrams per liter (mg/l) and 0.0979 mg/l, respectively. It is noted that CT ETPH was not reported above reporting limits in the duplicate sample collected from monitoring well HB-MW-08.

Metals: Total chromium was the only metal detected above reporting limits in monitoring well HB-MW-05 at a concentration of 0.0274 mg/l. This concentration was significantly lower than the concentration of 1.59 mg/l reported during the December 2011 sampling event. Hexavalent chromium was not detected above laboratory reporting limits in monitoring well HB-MW-05. Barium was the only metal detected above reporting limits in groundwater samples collected from monitoring wells HB-MW-07 and HB-MW-08 at concentrations ranging from 0.0695 mg/l to 0.0888 mg/l.

5.2 Data Quality Assessment and Data Usability Evaluation

All data were evaluated with respect to quality by conducting a DQA and DUE in accordance with the methodology described in the November 2007 guidance document entitled, *Reasonable Confidence Protocols* and presented in more detail in the May 2009 document entitled

Laboratory Quality Assurance Quality Control, Data Quality Assessment, Data Usability Evaluation Guidance Document. Both documents were revised in December 2010. The DQA was performed to assess the quality of the analytical data in each laboratory analytical report package.

QA/QC issues identified during the DQA process included:

- Results for Laboratory Control Sample (LCS) for VOCs outside the accepted range of variability;
- Recovery for surrogates was outside the accepted range of variability for PCBs in a single equipment blank sample.

After the laboratory analytical data were evaluated during the DQA, a DUE was performed. The DUE took into account the following:

- the site-specific conceptual site model (CSM);
- knowledge of the contaminant types, concentrations, and distribution;
- objectives for the data collection effort and the intended use of the data (i.e. the DQOs); and
- results from field QA/QC sampling.

The DQA worksheets are provided in Appendix E. The DQA resulted in identifying data for which the quality could potentially affect its use in decision-making.

The QA/QC deficiencies identified do not pertain to any of the primary constituents of concern for the Project Area. Taking into consideration multiple lines of evidence, results from the DUE indicated that the data generated during 2012 were usable for the intended purpose. A more detailed discussion of the DQA and DUE results is included in Appendix E.

5.3 Observed Trends in Groundwater

Trend graphs were generated for selected constituents using data collected from monitoring well HB-MW-07 from June 2007 through September 2012. Trend graphs are included in Appendix F. It should be noted that in the generation of constituent concentration graphs, a value of one half of the reporting limit was established for graphing in each instance where a particular constituent or compound was reported as a non-detect. Data trends for the past six years are discussed by analytical group in the paragraphs below.

Polychlorinated Biphenyls: PCBs have not been detected in groundwater samples collected during the post-remediation groundwater monitoring program. However, it should be noted that the reporting limit for total PCBs for all of the groundwater samples collected during 2008 was above the default, numeric SWPC of 0.5 µg/l. PCBs were not detected during 2009, 2010, 2011 or 2012 with reporting limits in the range of 0.25 µg/l to 0.31 µg/l.

Total Petroleum Hydrocarbons: CT ETPH has been detected fairly consistently in groundwater samples collected from monitoring well HB-MW-07. No discernable upward or downward trends were observed for CT ETPH based on analytical data for this monitoring well.

Volatile Organic Compounds: During 2012, no VOCs were detected above laboratory reporting limits in the groundwater sample collected from monitoring well HB-MW-07, although this well historically has contained various VOCs at trace concentrations (less than 7 µg/l).

Metals: In 2012, barium was detected in the groundwater sample collected from monitoring well HB-MW-07 at a concentration of 0.0888 mg/l, which is consistent with previous results.

A trend graph for total chromium concentrations in groundwater samples collected from monitoring well HB-MW-05 is provided to show that the elevated concentration of chromium reported in December 2011 was notably higher than concentrations typically detected in this monitoring well. The December 2011 is considered anomalous as confirmed by the additional sample collected from this location in January 2012. As indicated in the sections above, monitoring well HB-MW-05 is no longer sampled as part of the F&H Buildings Monitoring Program.

5.4 Evaluation of Results Relative to the RSRs

Groundwater analytical results obtained for the 2012 post-remediation monitoring were compared to the default numeric criteria of the RSRs. These criteria were established to protect existing uses of groundwater, surface water quality where groundwater plumes discharge into water bodies, and air quality from the effects of vapors emanating from VOCs present in contaminated groundwater.

According to the Ground Water Quality Classification data-layer in the most recent CT DEEP Geographic Information system (GIS) database, groundwater beneath the Site and surrounding areas is designated as “GB”. According to the CT DEEP Water Quality Standards (Ground Water Quality Standards Effective April 12, 1996), groundwater classified as GB is presumed

not suitable for human consumption without treatment. In "GB" groundwater quality areas, the groundwater protection aspect of the RSRs is designed to preserve water quality to permit the existing uses of groundwater and prevent further degradation of groundwater quality. No specific Ground Water Protection Criteria (GWPC) exists for groundwater in GB areas.

The groundwater analytical data collected from the Project Area have been compared to the default numeric SWPC, RVC and IVC. For comparative purposes, the analytical data were also evaluated relative to the draft VC listed in the *Proposed Revisions – Connecticut's Remediation Standard Regulations - Volatilization Criteria* proposed by the CT DEEP in March 2003. If finalized, the draft VC will apply to groundwater within 30 feet of the ground surface or a building.

The groundwater data were compared to both the RVC and IVC, as a draft ELUR prohibiting the use of the Site for residential purposes has been submitted to the Connecticut DEEP but has not been reviewed or approved. There were no exceedances of the current or 2003 proposed RVC or IVC or SWPC for groundwater data obtained during the 2012 groundwater sampling event.

5.4.1 Compliance Determination

This groundwater monitoring program has been designed to determine:

- the effectiveness of soil remediation in preventing further pollution of groundwater by substances from the release area;
- the effectiveness of any remediation taken to eliminate or minimize identified health or safety risks associated with such release;
- whether applicable surface-water protection criteria and volatilization criteria have been met; and
- whether any contaminant plumes emanating from the product area interfere with existing use of the groundwater for a drinking water supply or with any other existing use of the groundwater, including but not limited to industrial, agricultural or commercial uses.

PCBs, VOCs, and total metals were reported at concentrations that were less than SWPC, RVC and IVC during the 2012 annual monitoring event.

6. MAINTENANCE MONITORING

6.1 Monitoring Requirements

The post remediation maintenance program for the engineered control was developed to ensure that the structural integrity, design permeability, and effectiveness of the engineered control will be maintained. This maintenance program was developed to:

- periodically inspect the engineered control;
- identify measures to be taken to prevent run-on and run-off of stormwater from eroding or otherwise damaging the engineered control; and
- identify measures to be taken to correct the effects of any settling, subsidence, erosion or other damaging events or conditions.

The engineered control and the area surrounding the engineered control were inspected in March and September 2012 in the following areas:

1. Signs of erosion.
2. Signs of settling.
3. Signs of ponding and run on.
4. Damage to the pavement.
5. Permanent Survey Markers for the Engineered Control.
6. Monitoring well network.

The completed Post-Remediation Maintenance Monitoring forms are included in Appendix G of this report.

6.2 Summary of Maintenance Monitoring Activities

During the March 2012 inspection, small cracks in the pavement were observed within the engineered control area. The pavement in this area is used to prevent migration of rainwater and surface water into underlying soil. In April 2012, the cracks within the engineered control area were filled and sealed. No deficiencies were identified during the September 2012 cap inspection.

7. CONCLUSIONS

One annual groundwater monitoring event was performed in 2012 for the Project Area in accordance with Appendix B and Appendix C of the RAWP (LEA, 2004) and the Modified Groundwater Monitoring Program approved by CT DEEP on March 30, 2012. No PCBs were detected in any of the groundwater samples collected and analyzed in 2012. The continued absence of PCBs in groundwater indicates that the remediation activities within the Project Area have been effective in eliminating PCBs as a groundwater contaminant source.

The detected concentration of each of the constituents of concern for the Project Area was below the default, numeric Surface Water Protection Criteria (SWPC), Residential Volatilization Criteria (RVC) and Industrial Volatilization Criteria (IVC) of the Remediation Standard Regulations (RSRs) for the annual monitoring event conducted in 2012.

In December 2011, total chromium was detected in monitoring well HB-MW-05 at a concentration of 1.59 mg/l, which is significantly higher than previous detections of total chromium reported in this monitoring well or within the Project Area. Although there is no default, numeric SWPC established for total chromium, the concentration may be compared to the criteria established for hexavalent chromium (0.110 mg/l) and trivalent chromium (1.2 mg/l), of which the total chromium concentration in monitoring well HB-MW-05 exceeds both. This monitoring well was re-sampled in January 2012 for total chromium to confirm the December 2011 total chromium result. The concentration of total chromium reported from the January 2012 sampling event was 0.0274 mg/l, which is consistent with previous detections leading to suggest that the concentration of 1.59 mg/l reported in December 2011 represents a laboratory error. Additionally, hexavalent chromium was not detected above laboratory reporting limits in this monitoring well.

Maintenance monitoring inspections were conducted in March and September 2012 to evaluate the conditions of the engineered control. During the March 2012 inspection cracks were observed in the asphalt pavement within the engineered control area. In April 2012, the cracks were filled and sealed as a corrective action. No deficiencies were noted during the September 2012 inspection. Additional inspections and corrective action measures, if necessary, will continue to be implemented as part of the 2013 maintenance and monitoring program.

TABLES

Table 5-1
SUMMARY OF SAMPLING AND ANALYTICAL INFORMATION
Pratt & Whitney, East Hartford, Connecticut
2012 F&H Buildings Annual Groundwater Monitoring Report

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Sample Information					Analysis Information							
Location ID	Sample ID	Sample Date	Sampled Interval (ft)	Sample Class	LEAAnalyt. Lab.	Volatile Organics	Semivolatile Organics	Herbicides	Pesticides/ PCBs	Fuels/Oils	Metals	Miscellaneous Analyses
HB-MW-05	1249871	01/31/2012	4.80 - 14.80	GWS							X	
HB-MW-07	1263255	09/06/2012	5.00 - 15.00	GWS		x			x	X	X	
HB-MW-08	1263256	09/06/2012	7.00 - 17.00	GWS		X			x	X	X	
HB-MW-08	1263257	09/06/2012	7.00 - 17.00	GWS		X			x	x	X	

Printed on 11/16/2012

Table 5-2
SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER
Pratt & Whitney, East Hartford, Connecticut
2012 F&H Buildings Annual Groundwater Monitoring Report

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	Location ID	HB-MW-05	HB-MW-07	HB-MW-07	HB-MW-08	HB-MW-08	HB-MW-08	HB-MW-08
	Sample ID	1249871	1263255	1263255	1263256	1263256	1263257	1263257
	Sample Date	01/31/2012	09/06/2012	09/06/2012	09/06/2012	09/06/2012	09/06/2012	09/06/2012
	Sample Time	13:32	11:07	11:07	12:17	12:17	12:17	12:17
	Sample Depth	4.80' - 14.80	5.00' - 15.00	5.00' - 15.00	7.00' - 17.00	7.00' - 17.00	7.00' - 17.00	7.00' - 17.00
	Laboratory	ACTM	ACTM	ACTM	ACTM	ACTM	ACTM	ACTM
	Lab. Number	MC7631-1	MC13780-4	MC13780-5	MC13780-6	MC13780-7	MC13780-8	MC13780-9
Constituent	Units							
Date Metals Analyzed	-	02/03/2012		09/10/2012		09/10/2012		09/10/2012
Date Organics Analyzed	-				09/12/2012		09/12/2012	
Date Physical Analyzed	-		09/11/2012		09/10/2012			
Barium (unfiltered)	mg/L			0.0888		0.0699		0.0695
Chromium, Total (unfiltered)	mg/L	0.0274						
Total Petroleum Hydrocarbons (CT ETPH)	mg/L		0.0830		0.0979			
1,1,1-Trichloroethane	ug/L				4.8		4.9	
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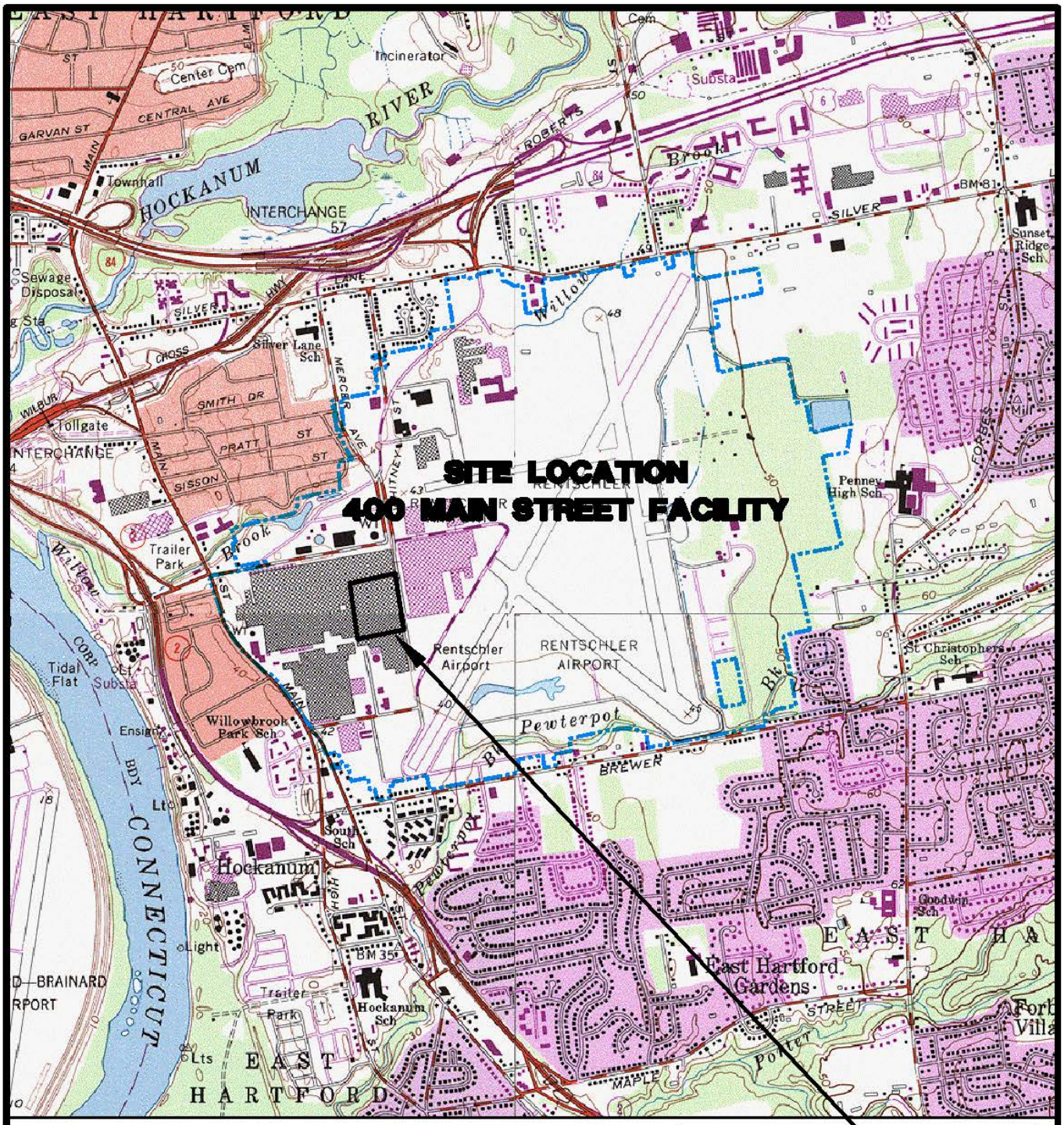
FIGURES



MAP REFERENCE:
USGS 7.5 MINUTE SERIES QUADRANGLES FOR HARTFORD NORTH, HARTFORD SOUTH, GLASTONBURY,AND MANCHESTER CONN., DATED 1964 & 1963 AND REVISED 1992.

1000 0 1000 2000 3000

SCALE IN FEET

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2012 Annual Post-Remediation Maintenance And Groundwater Monitoring Report

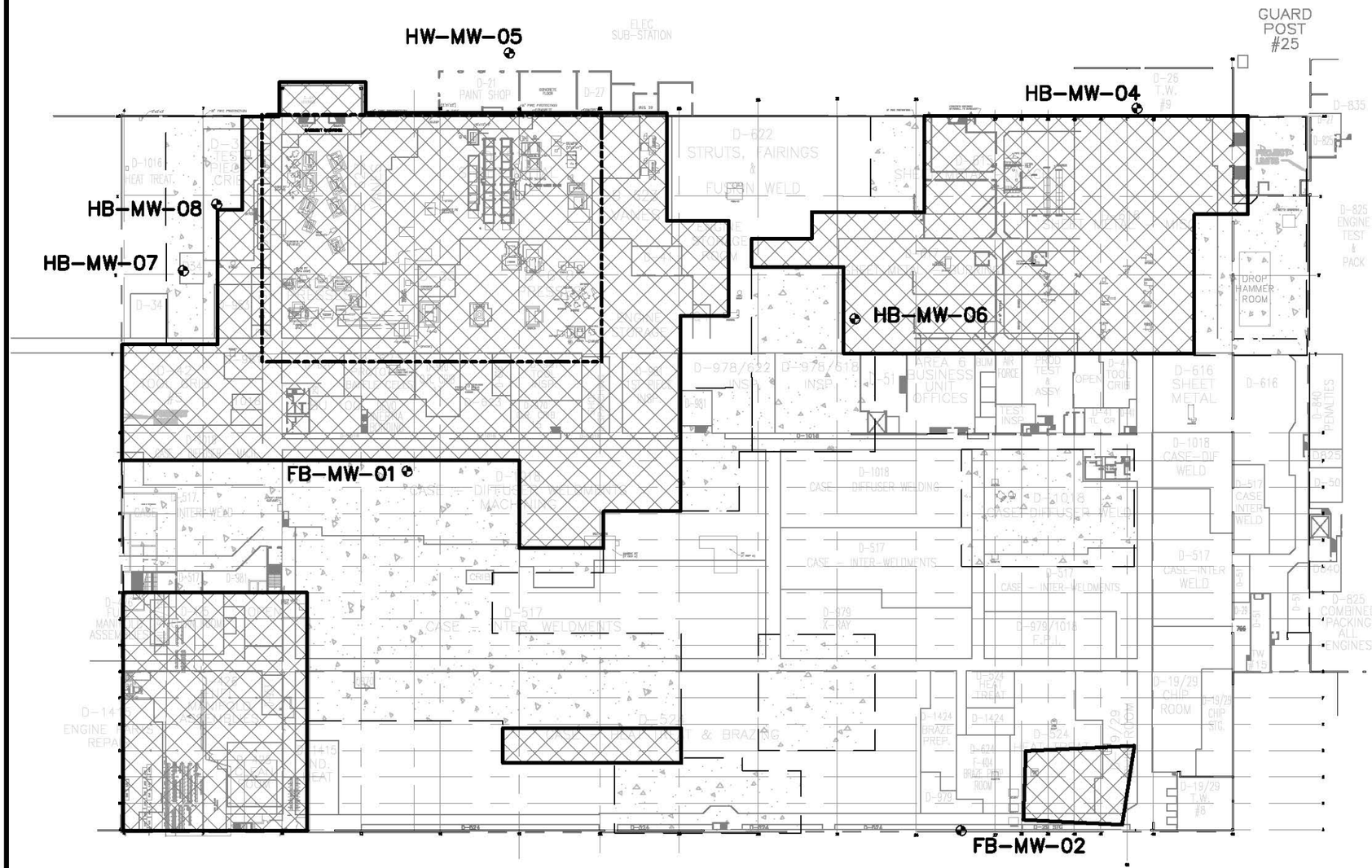
F&H BUILDINGS, PRATT & WHITNEY DIVISION, EAST HARTFORD, CONNECTICUT

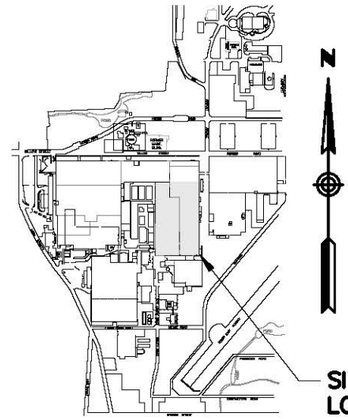
SITE LOCATION MAP

Comm.No. 88UT136

FIGURE 2-1

Loureiro





KEY MAP
NOT TO SCALE

LEGEND

APPROXIMATE LIMITS OF BITUMINOUS ASPHALT

APPROXIMATE LIMITS OF PREVIOUS CONCRETE REMOVAL & REPLACED WITH PROCESSED AGGREGATE BASE

APPROXIMATE LIMITS OF ENGINEERED CONTROL

MONITORING WELL LOCATION

N

50 0 50 100 150

SCALE IN FEET

2012 Annual Post-Remediation Maintenance And Groundwater Monitoring Report

F&H BUILDINGS, PRATT & WHITNEY DIVISION, EAST HARTFORD, CONNECTICUT

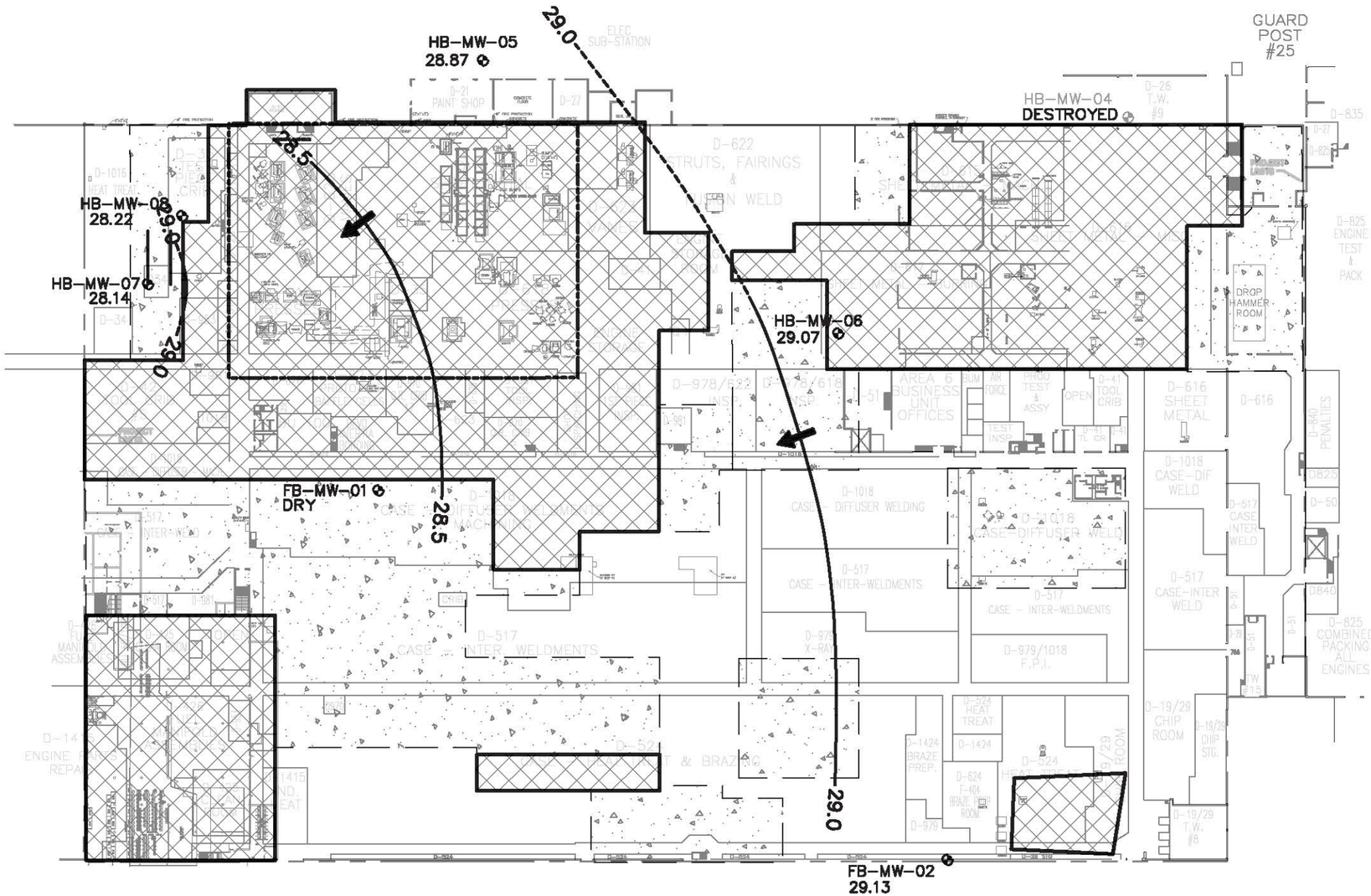
SITE PLAN

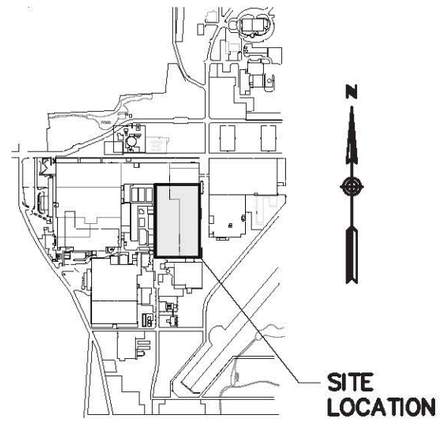
Comm.No. 88UT136

FIGURE 4-1

Loureiro Engineering • Construction • Infill • Energy • Vapor

G:\AUTOCAD\PROJECTS\PWEH88UT136\2012 ANNUAL POST-REMEDIATION MAINTENANCE & GW MONIT-REPORT\2012-APR-GWMREPORT-88UT136-F4-1-SITE.DWG Tab: 4-1 Saved: 1/15/2013 3:29 PM Plotted: 1/15/2013 3:33 PM





KEY MAP
NOT TO SCALE

LEGEND

- APPROXIMATE LIMITS OF BITUMINOUS ASPHALT
- APPROXIMATE LIMITS OF PREVIOUS CONCRETE REMOVAL & REPLACED WITH PROCESSED AGGREGATE BASE
- APPROXIMATE LIMITS OF ENGINEERED CONTROL
- MONITORING WELL LOCATION
- GROUNDWATER CONTOUR DASHED WHERE INFERRED
- GROUNDWATER FLOW DIRECTION

GROUNDWATER ELEVATIONS: SEPTEMBER 2012

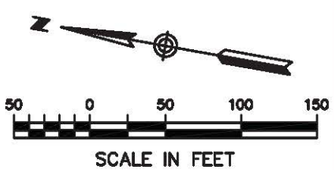
Monitoring Well Identification	Top of Riser Elevation (ft)	Depth to Water[1](ft)	Groundwater Elevation[2] (ft)
FB-MW-01	38.21	DRY	--
FB-MW-02	38.32	9.19	29.13
HB-MW-04	38.08	Destroyed	--
HB-MW-05	39.35	10.48	28.87
HB-MW-06	38.24	9.17	29.07
HB-MW-07	38.16	10.02	28.14
HB-MW-08	37.84	9.62	28.22

NOTES:

(1) DEPTH TO WATER MEASUREMENTS WERE RECORDED FROM TOP OF RISER ON SEPTEMBER 6, 2012.

(2) GROUNDWATER ELEVATIONS WERE CALCULATED USING TOP OF RISER MEASUREMENT.

ft INDICATES FEET



2012 Annual Post-Remediation Maintenance And Groundwater Monitoring Report

F&H BUILDINGS, PRATT & WHITNEY DIVISION, EAST HARTFORD, CONNECTICUT

SEPTEMBER 2012 GENERALIZED GROUNDWATER CONTOUR MAP

Comm.No. 88UT136

FIGURE 4-2

Loureiro Engineering • Construction • Infill • Energy • Vapor

G:\AUTOCAD\PROJECTS\PWEH88UT136\2012 ANNUAL POST-REMEDIATION MAINTENANCE & GW MONIT-REPORT\2012-APR-GWMREPORT-88UT136-G2011-12-F4.DWG Tab: 1 Saved: 1/15/2013 3:29 PM Plotted: 1/16/2013 1:55 PM

Appendix A

LEA Proposed Modifications to Groundwater Monitoring Program and CT DEEP Approval Letter

Loureiro Engineering Associates, Inc.

February 24, 2012

State of Connecticut
Department of Energy and Environmental Protection
Remediation Division
79 Elm Street
Hartford, CT 06016-5127

Attn: Maurice Hamel

RE: Proposed Modifications to F&H Buildings Groundwater Monitoring Program
UTC/Pratt & Whitney, East Hartford, Connecticut Facility
LEA Comm. No. 88UT045

Dear Mr. Hamel:

On behalf of United Technologies Corporation (UTC), post-remediation groundwater monitoring is being conducted by Loureiro Engineering Associates, Inc. (LEA) to demonstrate the effectiveness of polychlorinated biphenyl (PCB) remediation of soil and concrete at areas underlying the former F&H Buildings (herein after referred to as the "Project Area") at the UTC/Pratt & Whitney manufacturing facility in East Hartford, Connecticut (herein after referred to as the "Site Area"). Analytical results from the last nineteen consecutive quarterly monitoring events indicate that the Residential Volatilization Criteria (RVC) and Industrial/Commercial Volatilization Criteria (IVC) have been met for all constituents of concern. Exceedances of the Surface Water Protection Criteria (SWPC) were noted in six of the quarterly sampling events, however, an evaluation with respect to the default, numeric SWPC is not appropriate for the Project Area since multiple down gradient wells exist which will be used to assess compliance for the entire Site at a later date. As such, we are requesting approval on behalf of UTC/Pratt & Whitney for a reduction in the groundwater monitoring program. Information supporting a reduction in the groundwater monitoring program is presented herein.

Remediation Summary

The remediation of concrete and soil underlying the Project Area was undertaken by UTC/Pratt & Whitney on a voluntary basis in accordance with the document entitled *Remedial Action Work Plan and Request for Variance Engineered Control for Polluted Soil* (RAWP), approved by the Connecticut Department of Energy and Environmental Protection (CTDEEP) on June 8, 2005. The remediation included the excavation and off-site disposal of concrete containing total PCB concentrations in excess of 10 milligrams per kilogram (mg/kg) and all soil containing total PCB concentrations in excess of 25 mg/kg. An engineered control (consisting of a 40-mil thickness high-density polyethylene liner, 18-inches of granular fill overlain by a minimum of 3-inches of process aggregate, and a 3-inch of bituminous pavement surface cover) was installed over a

portion of the Project Area where PCBs in soil continued to exceed 10 mg/kg. Remediation of the Project Area was completed on December 6, 2006.

Post-Remediation Groundwater Monitoring

Post-remediation groundwater monitoring began in June 2007 to verify the adequacy of the remediation and long-term effectiveness of the engineered control. Six monitoring wells (FB-MW-01, FB-MW-02, and HB-MW-04 through HB-MW-07) located within and immediately surrounding the Project Area are currently sampled on a quarterly basis in accordance with the Post-Remediation Groundwater Monitoring Plan (included as Appendix B of the CTDEEP-approved RAWP). Monitoring well locations are depicted on the attached Figure 1.

Groundwater samples from all six monitoring wells are analyzed on a quarterly basis for PCBs by United States Environmental Protection Agency (EPA) Method 8082; volatile organic compounds (VOCs) by EPA Method 8260B; Connecticut Extractable Total Petroleum Hydrocarbons (ETPH) by the CTDEEP approved method; and total metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc). Reports documenting the post-remediation groundwater monitoring are submitted to CTDEEP on an annual basis.

PCBs have not been detected in any of the groundwater samples analyzed during the post-remediation groundwater monitoring program. Low concentrations of chlorinated VOCs, ETPH and total metals have been detected in groundwater samples on an intermittent basis since the start of post-remediation groundwater monitoring. As indicated by attached summary table, there have been no exceedances of the applicable Connecticut Remediation Standard Regulations (RSRs) criteria with the exception of exceedances of the default, numeric SWPC. Exceedances of the default, numeric SWPC were noted for one or more of the following: arsenic, copper, and tetrachloroethylene, in 6 of the 19 quarterly sampling events. However, an evaluation with respect to the SWPC is not appropriate for the Project Area since multiple down gradient wells exist which will be used to assess compliance for the entire Site at a later date

Groundwater Monitoring Program Reduction

A reduction in the groundwater monitoring program to determine the cap effectiveness is being proposed in response to the nineteen consecutive quarters of compliance with the applicable RSRs criteria and the absence of any increasing trends for the constituents of concern. The reduced monitoring plan would include annual sampling of existing monitoring well (HB-MW-07) and a proposed additional monitoring well that will be installed immediately downgradient of the engineered control. The location of the proposed additional monitoring well is identified on Figure 1. Although there were no exceedances of the GB Pollutant Mobility Criteria (GB PMC) noted for VOCs, ETPH, and metals within the engineered control area, all future groundwater samples from the two monitoring wells described above are proposed to be analyzed for PCBs, VOCs, and ETPH to continue to assess the cap's effectiveness. Visual inspections will be performed on a semi-annual basis.

An annual monitoring frequency is considered more than adequate for two reasons. First, groundwater flowing from the Project Area is captured by the basement dewatering pumps located in G Building, which operate at a typical combined flow rate of approximately 120,000 gallons per day. These pumps have operated for many years and will continue to operate for the foreseeable future. Extracted groundwater is treated and discharged to sanitary sewer in accordance with Pratt & Whitney's State Pollutant Discharge Elimination System (SPDES) Permit. If a new release to groundwater occurred as a result of damage to the engineered control, the release would be captured by the basement dewatering pumps prior to reaching the downgradient receptor of concern (i.e. Willow Brook). Second, the nearest downgradient receptor of concern is Willow Brook, which is located over 1,200 feet from the Project Area. Based on an average linear groundwater flow velocity of 2.2 feet per day, the estimated timeframe for contamination to reach Willow Brook (in the absence of basement dewatering) is approximately 1.5 years. This estimate does not factor contaminant retardation, which would be significant for the constituents of concern in soil beneath the engineered control. Therefore, a new release would be detected well in advance of reaching Willow Brook with an annual groundwater monitoring frequency. In addition, visual inspections will be completed on a semi-annual basis to confirm the integrity of the engineered control.

The last groundwater monitoring event for 2011 was completed on December 8, 2011. As such, we are proposing to conduct the next monitoring event in December 2012. Subsequent monitoring events would be conducted in accordance with the proposed reduction in groundwater monitoring frequency upon approval by the CTDEEP.

Based all of the data accumulated for the Project Area, the revised monitoring plan is considered adequate to confirm that the engineered control continues to prevent further impacts to groundwater quality. As such, we are requesting your approval of the proposed reductions to the groundwater monitoring program.

Should have any questions or comments regarding this submission or any other aspect of the project, please contact me at 860-410-3028.

Sincerely,

LOUREIRO ENGINEERING ASSOCIATES, INC.

David Fiereck, P.E., L.E.P.
Vice President

Attachments

cc: Joseph Tota, UTC

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

MARCH 30, 2012

APPROVAL

Joseph Tota
EH&S Department
United Technologies
One Financial Plaza
Hartford, CT 06101

RE: Pratt & Whitney – Building F&H
400 Main Street, East Hartford

Dear Mr. Tota:

The Remediation Division of the Bureau of Water Protection and Land Reuse has reviewed the document titled "Proposed Modifications to F&H Buildings Groundwater Monitoring Program, UTC/Pratt & Whitney, East Hartford, Connecticut Facility" (Monitoring Plan), dated February 24, 2012. The proposed Monitoring Plan was submitted in conjunction the approved engineered control for Buildings F & H at the 400 Main Street facility in East Hartford.

The Monitoring Plan proposes a revised groundwater monitoring program for the Engineered Control, consisting of an annual monitoring event to be performed in August, September or October from two wells specified in the Monitoring Plan with analyses for PCBs, VOCs, ETPH, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, sliver, and zinc.

The proposed Monitoring Plan is hereby approved pursuant to 22a-133k-2(f)(2) RCSA.

Nothing in this approval shall affect the Commissioner's authority to institute any proceeding, or take any action to prevent or abate pollution, to recover costs and natural resource damages, and to impose penalties for violations of law. If at any time the Commissioner determines that the approved actions have not fully characterized the extent and degree of pollution or have not successfully abated or prevented pollution, the Commissioner may institute any proceeding, or take any action to require further investigation or further action to prevent or abate pollution.

In addition, nothing in this approval shall relieve any person of his or her obligations under applicable federal, state and local law.

If you have any questions pertaining to this matter, please contact Maurice Hamel of my staff at 860/ 424-3787.

Sincerely,

Patrick F. Bowe, Director
Remediation Division
Bureau of Water Protection and Land Reuse

PFB:MRH
c: David Fiereck, LEA

Appendix B

Boring Log and Well Completion Log for HB-MW-08

GEOLOGIC BORING LOG

Project: UTC P&WEH 2011 F&H Bldgs GW Monitoring **LEA Commission Number** 88UT136.001 **Client** Pratt & Whitney Division - JTot **Location** P&W East Hartford	**Start Date** 08/02/2012 **End Date** 08/02/2012	**Boring ID** **HB-MW-08**

Drilling Contractor	Loureiro Engineering Associates, Inc.	**Logged by**	Keith Volkert
Drilling Method	Direct Push	**Drilling Foreman**	Jeremy Corcoran
Sampling Method	Macro Core	**Drill Rig**	Geoprobe 97
Groundwater Observation		**Surface Elevation**	
Depth 9.6 **at** **Hours**		**Latitude**	
Depth **at** **Hours**		**Longitude**	

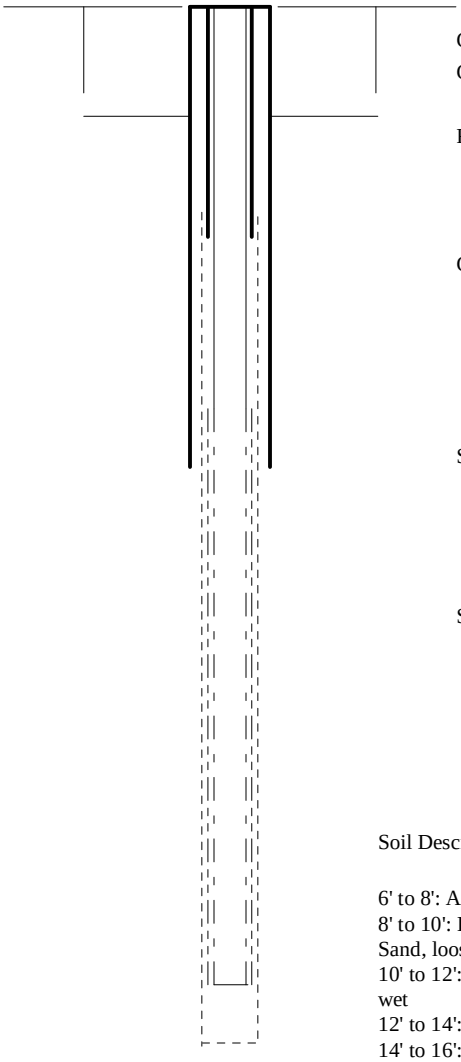
Depth	Sample Information			Soil Description	PID/FID ppm
	Sample No.	Recovery (%)	Blows /6"	Color, Primary Grain Size, Secondary Grain Sizes, Moisture, Sorting, Sphericity, Angularity, Sedimentary Structure, Density, Cohesiveness, Other	
0-		100		Brown fine to medium SAND, little Brick and Concrete and fine to medium Gravel, loose, moist	0.0
2-		100		As Above	0.0
4-		100		As Above	0.0
6-		100		As Above	0.1
8- V		77		Light brown fine to medium SAND, trace coarse Sand, loose, wet at 9'	0.2
10-		77		Brown fine to coarse SAND, trace Silt, loose, wet	0.0
12-		67		As Above	0.1
14-		67		As Above	0.0
16-		100		As Above Bottom of Boring at 18'	0.1
18					

WELL COMPLETION LOG

Project: UTC P&WEH 2011 F&H Bldgs GW Monitoring **LEA Commission Number** 88UT136.001 **Client** Pratt & Whitney Division - JTot **Location** P&W East Hartford	**Start Date** 08/02/2012 **End Date** 08/02/2012	**Well ID** **HB-MW-08**

Drilling Contractor Loureiro Engineering Associates, Inc. **Logged by** Keith Volkert
Drilling Method Direct Push **Drilling Foreman** Jeremy Corcoran
Sampling Method Macro Core **Drill Rig** Geoprobe 97

Groundwater Observation
Depth 9 **at** **Hours**
Average depth to water is 9.62



Protector
- Material
- Diameter 6"
- Length 8"
- Stickup
- Key #
- Cover Type Roadbox

Ground

Concrete Diameter 2x2'
Concrete Thickness 1.5'

Reference
- Elevation
- Description

Top Seal
- Top
- Bottom
- Material

Casing
- Diameter 1.5"
- Material Sch40 PVC
- Length 7.0
- Top Elevation

Backfill
- Top
- Bottom
- Material

Seal
- Top 0.0
- Bottom 4.0
- Material Bentonite chips

Secondary Sand
- Top 4'
- Bottom 17'
- Size Zero Sand

Screen
- Top 7.00
- Bottom 17.00
- Material Sch40 PVC
- Diameter 1.5"
- Length 10.0
- Slot Size 10

Filter Pack
- Top 7.0
- Bottom 17.0
- Material Prepack

Reported depth to bottom of boring 18.00
Last measured depth 16.76

Comments

Soil Description

6' to 8': As Above
8' to 10': Light brown fine to medium SAND, trace coarse Sand, loose, wet at 9'
10' to 12': Brown fine to coarse SAND, trace Silt, loose, wet
12' to 14': As Above
14' to 16': As Above
16' to 18': As Above

Bottom of Boring at 18'

Vertical scale ~ 1:40

Appendix C

Copies of Field Paperwork

DAILY FIELD REPORT

Loureiro Engineering Associates, Inc.

LEA Comm. No.	**88UT136.001**	Page 1 of 4	
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 1/31/12	
Location	P&W East Hartford, East Hartford, CT		
Client	Pratt & Whitney Division - JTot		

Arrived at Site 1230 Departed from Site 1345 Vehicle ST-22

Odometer (Start) Return

Site Activities

- [ ] Soil Sampling
- [x] Groundwater Sampling
- [ ] Surface Water Sampling
- [ ] Vapor/Air Sampling
- [ ] Concrete Sampling
- [ ] Other Sampling
- [ ] Other Sampling
- [ ] Well Development
- [ ] Geoprobe Work
- [ ] Concrete Coring
- [ ] Construction
- [ ] Waste Management
- [ ] Inspection
- [ ] Site Walk Over
- [ ] Surveying
- [ ] Other (Describe)

Current Project Information

Last Sample Number Used	(EV)
Last Location ID Used	
Current Location (if not complete)	
Sampling for	see C.O.C
Laboratories used	Accutest
Paperwork & Equipment left at/in	office / yard
Site Contact	R. McKinney
Contractors on Site	LEA
Time and place to meet contractors	(D)

Non-productive Time

- [x] None
- [ ] Equipment Breakdown
- [ ] Late
- [ ] Weather
- [ ] Missing Equipment
- [ ] Other (Describe)

Quality Assurance Checks

Yes	N/A	No	
✓			Sample labels complete
✓			Sample/cooler seals OK
✓			All samples obtained
✓			Chains of custody
✓			All forms/logs complete
✓			Site condition OK
✓			Site H&S Plan on site
✓			Instruments calibrated

Residuals Disposition

Item	Approx. Amount	Container ID
Soil/Solid		
Groundwater	1.5 gal	802549
Decon Fluid		
PPE		
Other		

Weather Conditions

Temperature 50°F Precipitation None Wind light

Comments

Checked By

R McKinney

Expendable Items Used

Qty	Item	LEA Number
	Bailer, Disposable (specify size)	090
	Drum, Closed Top 55 Gallon	086
	Filter, In Line	024
~~1~~	~~Miscellaneous Health & Safety Items~~ (RM)	060
2'	Tubing, ~~1/2", NOS~~ poly	007
15'	Tubing, 3/8", NOS	008
	Water, Distilled	025

Equipment Used

Qty	Item	LEA Number
	Generator 3500 Watt	153
	Meter, Conductivity	022
	Meter, pH/Temp	021
~~1~~	~~Miscellaneous Small Tools & Equipment~~ (RM)	152
	Pump, Grundfos	073
~~1~~	~~Pump, Peristaltic (spec. Master or Isco)~~ (RM)	040
	Pump, Submersible	201
	Pump, Watera	038
~~1~~	~~Turbidimeter~~ (RM)	023
~~1~~	~~VOC Analyzer, Photovac 2020 (PID)~~ (RM)	012
~~1~~	~~Water Level Indicator~~ (KA)	028
~~1~~	~~Water Quality Meter w/Flow Cell~~ (RM)	070

Field Personnel Kara D'Onofrio

Signature Kara D'Onofrio

Loureiro Engineering Associates, Inc.

DAILY FIELD REPORT
CALIBRATION RECORD

LEA Comm. No.	**88UT136.001**
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring
Location	P&W East Hartford, East Hartford, CT
Client	Pratt & Whitney Division - JTot
Date	1/31/12

pH Meter/Serial # 08D101030

	Time	pH 4.01	pH 7.00	pH 10.01	Spec. Cond.	ORP	DO
Initial Calibration	0830	4.00	7.00	10.00	1000	100	100%
Calibration Check							
Calibration Check							

Turbidity Meter/Serial # 2017

	Time	0 NTU	20 NTU	100 NTU	800 NTU
Initial Calibration	0830	0.00	20.0	100	—
Calibration Check					
Calibration Check					

PID Meter/Serial # 3056

	Time	Standard	Meter Reading	~~Zero~~ calibrate with
Initial Calibration	0815	100	99.6	isobutylene
Calibration Check				
Calibration Check				

Balance/Serial #

	Time	Standard	Balance
Initial Calibration			
Calibration Check			
Calibration Check			

Comments

Field Personnel: Kara D'Onofrio

Signature Kara D'Onofrio

Loureiro Engineering Associates, Inc.

DAILY FIELD REPORT

Supplemental Sheet

LEA Comm. No.	**88UT136.001**	Page 3 of 4
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 1/31/12
Location	P&W East Hartford, East Hartford, CT	
Client	Pratt & Whitney Division - JTot	

Description of Site Activities

1230 - on-site, set-up for sampling at HB-MW-05

1345 - sampling complete, off-site

Field Personnel	Kara D'Onofrio	***Signature*** Kara D'Onofrio

Loureiro Engineering Associates, Inc.

FIELD SAMPLING RECORD
LOW FLOW WELL SAMPLE

LEA Comm. No.	**88UT136.001**	Page 4 of 4
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 1/31/12
Location	P&W East Hartford, East Hartford, CT	Sample Time 13:32
Client	Pratt & Whitney Division - JTot	

Monitoring Well Number HB-MW-05 Sample Number(s) 1249871 uf

Initial Field Data and Measurements

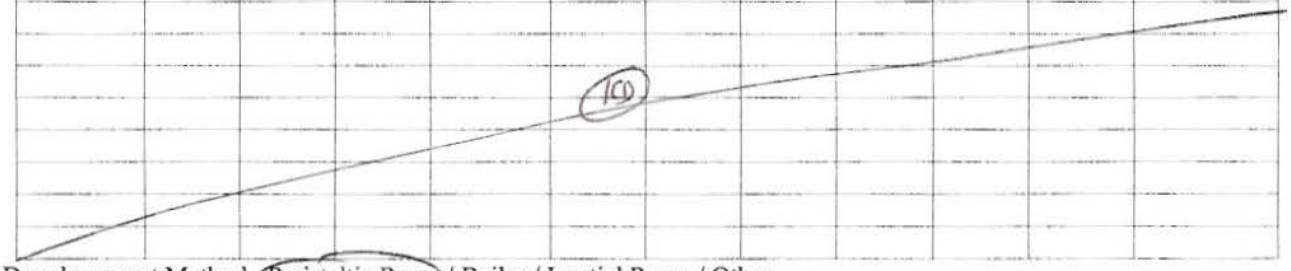
Depth of Well 14.49' Reference Used TOR
Depth to Water 9.95' PID/FID Reading 0.0
Height of Column 4.54' Interface Yes / (No) If yes, Depth ——— Lighter / Heavier

Well Casing Diameter 1.5" Material PVC
Protector (Road Box) / Stickup
Ground to Reference TOR
Comments

General Condition	OK	Bad
Casing Secure	✓	
Collar Intact	✓	
Cover Locked	✓	
Other (describe)		

Development Information

Time \ Parameter	Depth to Water	Pump Setting	Purge Rate (mL/min)	Cum. Liters Purged (L)	Temp (C)	Spec. Cond. (uS/cm)	pH (SU)	ORP (Eh)	DO (mg/L)	Turbidity (NTU)	Comment
1245	9.95'	300	200	Begin	Purging						
1255	9.96	300	200	1.0	15.42	1491	6.10	137.4	7.81	20.1	
1300	9.96	300	200	1.5	15.57	1488	6.07	139.3	8.74	9.51	
1305	9.96	300	200	2.0	15.51	1452	5.99	150.8	8.94	4.25	
1310	9.96	300	200	2.5	15.45	1430	5.96	155.7	7.82	3.76	
1315	9.96	300	200	3.0	15.49	1412	5.88	169.1	7.78	3.21	
1320	9.96	300	200	3.5	15.45	1424	5.91	164.7	7.66	2.97	
1325	9.96	300	200	4.0	15.45	1422	5.89	169.7	7.77	2.90	
1330	9.96	300	200	4.5	15.41	1429	5.90	165.1	7.72	2.85	
1332	Sample Collected										



Developement Method (Peristaltic Pump) / Bailer / Inertial Pump / Other

Sample Field Treatment *If any ambiguity could exist, be sure to indicate the field treatment applied to each sample aliquot with the appropriate suffix in the sample ID on both the sample bottle label and on the Chain of Custody!*

Field Decontamination? (Yes) / No If Yes, with what? DI/methanol wipe for Cr III
Waste Container ID 802549

Additional Comments

Sampled for Total Chromium + Hexavalent Chromium.

Field Personnel Kara D'Onofrio *Signature* Kara D'Onofrio

ACCUTEST LABORATORIES

CHAIN OF CUSTODY

Accutest Laboratories of New England
495 Technology Center West, Building One
TEL. 508-481-6200 FAX: 508-481-7753
www.accutest.com

PAGE 1 of 1

FED-EX Tracking #: | Bottle Order Control #:

Accutest Quote #: F01/2012-218 | Accutest Job #:

Client / Reporting Information

Company Name: Loureiro Engineering Associates
Street Address: 100 Northwest Drive
City: Plainville State: CT Zip: 06062
Project Contact: Robin McKinney E-mail:
Phone #: 860-747-6181 Fax #:
Sampler(s) Name(s): K. D'Onofrio Phone #:

Project Information

Project Name: P3W EHF3H Buildings GW Monitoring
Street: Willow Street
City: East Hartford
Project#: 88UT136
Client PO#:
Project Manager:

Billing Information (If different from Report to)

Company Name:
Street Address:
City State Zip:
Attention: PO#:

Requested Analysis (see TEST CODE sheet)

Total Chromium
Hexavalent Chromium

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL- Sludge
SED-Sediment
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid
WP - Wipe
FB-Field Blank
EB- Equipment Blank
RB- Rinse Blank
TB-Trip Blank

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	Bisulfite	Total Chromium	Hexavalent Chromium	LAB USE ONLY
	1249871 uf		1/3/12	1332	KD	GW	2			1		(a)	(a)				X	X	

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [x] CT RCP
- [ ] MA MCP
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary

Comments / Special Instructions

Provide RCP Report (RM)

Turnaround Time (Business days)

Approved By (Accutest PM): / Date:

- [x] Std. 10 Business Days
- [ ] Std. 5 Business Days (By Contract only)
- [ ] 5 Day *RUSH*
- [ ] 3 Day *EMERGENCY*
- [ ] 2 Day *EMERGENCY*
- [ ] 1 Day *EMERGENCY*

Emergency & Rush T/A data available VIA Labilink

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	K. D'Onofrio	1-31-12 1500	B. Clark	2		2
3			3	4		4
5	Relinquished by:	Date Time:	Received By:	Custody Seal #	Intact / Not Intact	Preserved where applicable / On Ice / Cooler Temp.

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DAILY FIELD REPORT

Page 1 of 5

LEA Comm. No.	**88UT136.001**
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring
Location	P&W East Hartford, East Hartford, CT
Client	Pratt & Whitney Division - JTot

Date 8/2/12

Arrived at Site 1400 Departed from Site 1600 Vehicle ST-16

Odometer (Start) Return 56 miles RT

Site Activities

- [ ] Soil Sampling
- [ ] Groundwater Sampling
- [ ] Surface Water Sampling
- [ ] Vapor/Air Sampling
- [ ] Concrete Sampling
- [ ] Other Sampling
- [ ] Other Sampling
- [x] Well Installation
- [ ] Well Development
- [ ] Geoprobe Work
- [ ] Concrete Coring
- [ ] Construction
- [ ] Waste Management
- [ ] Inspection
- [ ] Site Walk Over
- [ ] Surveying
- [ ] Other (Describe)

Current Project Information

Last Sample Number Used
Last Location ID Used
Current Location (if not complete)
Sampling for
Laboratories used
Paperwork & Equipment left at/in
Site Contact
Contractors on Site

Non-productive Time

- [x] None
- [ ] Equipment Breakdown
- [ ] Late
- [ ] Weather
- [ ] Missing Equipment
- [ ] Other (Describe)

Time and place to meet contractors

Quality Assurance Checks

Yes	N/A	No	
	✓		Sample labels complete
	✓		Sample/cooler seals OK
	✓		All samples obtained
	✓		Chains of custody
✓			All forms/logs complete
✓			Site condition OK
✓			Site H&S Plan on site
✓			Instruments calibrated

Residuals Disposition

Item	Approx. Amount	Container ID
Soil/Solid	5 gal	826094
Groundwater		
Decon Fluid		
PPE		
Other		

Checked By

HP

Weather Conditions

Temperature Precipitation Wind

Comments

Expendable Items Used

Qty	Item	LEA Number
	Bailer, Disposable (specify size)	090
	Cap, PVC, 1", (Threaded or FJT)	147
	Cap, PVC,1', Slip (S447010)	146
	Concrete, 60 lb. Bag	085
1	Decontamination Supplies	081
	Drum, Closed Top 55 Gallon	086
	Drum, Open Top 55 Gallon	086
	Filter, Zap Cap	024
	Grout mix, bag	237
	Locks, Monitoring Well	155
1	Miscellaneous Health & Safety Items	060
	Plug, Locking, 2"	233
	Sand, Filter Pack, Bags	220
	Water, Distilled	025
	Well Point, 1" Sch 80 (FJT or ?)	216
	Well Protector, Roadbox, 4"	135

Equipment Used

Qty	Item	LEA Number
	Meter, pH/Temp	021
1	Miscellaneous Small Tools & Equipment	152
	Pump, Grundfos	073
	Pump, Peristaltic (spec. Master or Isco)	040
	Pump, Submersible	201
	Pump, Watera	038
	Thermo-Anemometer	248
	Turbidimeter	023
	VOC Analyzer, Photovac 2020 (PID)	012
	Water Level Indicator	028

Field Personnel Jeremy Corcoran
Keith Volkert

Signature

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DAILY FIELD REPORT

Supplemental Sheet

LEA Comm. No.	**88UT136.001**	Page 2 of 5
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 8/2/12
Location	P&W East Hartford, East Hartford, CT	
Client	Pratt & Whitney Division - JTot	

Description of Site Activities

900 - on site
- Hand Auger Refusal 4' on concrete
- Call R. McKinney
930 - R. McKinney Call Corbitt to clear off Set location.
- off site
1400 - on site
1445 - Complete Soil boring
1550 - Complete well ~~completion~~ & Installation
1600 - off site

Field Personnel: Jeremy Corcoran, Keith Volkert

Signature

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DAILY GEOPROBE REPORT

LEA Comm. No.	**88UT136.001**
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring
Location	P&W East Hartford, East Hartford, CT
Client	Pratt & Whitney Division - JTot

Date 8/2/12

Arrived at Site 1400 Departed from Site 1600 Geoprobe GP57

Odometer (Start) Return

Probe Hours (Start) Finish

Vehicle Checklist/Condition

OK	Geoprobe	OK	Trailer (if used)
✓	Engine Fluids	✓	Brakes (Incl. battery)
✓	Transmission	✓	Hitch
✓	Brakes (Incl. parking)	✓	Safety Chains
✓	Lights	✓	Lights
✓	Signals	✓	Signals
✓	Tires	✓	Tires
✓	General	✓	General
	Other (describe)		Other (Describe)

Equipment Broken/Needing Repair

All checks above must be OK and signed off before leaving in the morning

Signature

Expendable Items Used

Qty	Item	LEA Number
1	Bentonite Chips, Bag	089
	Bentonite Pellets, Buckets	
10	Cap, End, Vinyl (AT-641K or AT-726K)	150
	Cap, Slip, 0.5" Vinyl (AT-441)	044
	Cap, Slip, 1" PVC (S447010)	146
	Cap, Threaded, 1" PVC	147
	Concrete, 60 lb. Bag	085
	Connectors, Snap Lock (GW-2030)	210
1	Decontamination Supplies	081
	Ear Plugs	
	Filter, In Line	024
	Liners, LB PETG (AT-825k)	128
5	Liners, MC Acetate	173
	Liners, MC PETG	173
	Locks, Monitoring Well	155
	Miscellaneous Health & Safety Items	060
	Point, Drive, Exp., SP15 (GW-15)	003
1	Point, Exp. (spec. GW-2040 or GW-445)	002
1	Sand, Filter Pack, Bags	220
	Tubing, 1/2", NOS	007
	Water, Distilled	025
	Well Point, 1" Sch.80 PVC	216
1	Well Protector, Road Box (10581)	014
	Well Protector, Roadbox, 7"	014
	Well Protector, Stickup, 4" (10127)	014
	Well Riser, 0.5" PVC, 5' (GW2050)	228
	Well Riser, 1" Sch. 80 PVC, 5' (1058CATB	131
3	Well Screen, ~~1"~~ Sch. ~~80~~ PVC, 5' (105810 1.5" HSA	130
2	Well Screen, Pre-Packed, ~~3/4~~ (GW-2010) 5'	224

Equipment Used

Qty	Item	LEA Number
	Exhaust Hose	033
	Miscellaneous Small Tools & Equipment	152
	Probe Rod Jack	119
	Pump, Grout	200
	Thermo-Anemometer	248

Field Personnel Jeremy Corcoran

Keith Volkert

Signature

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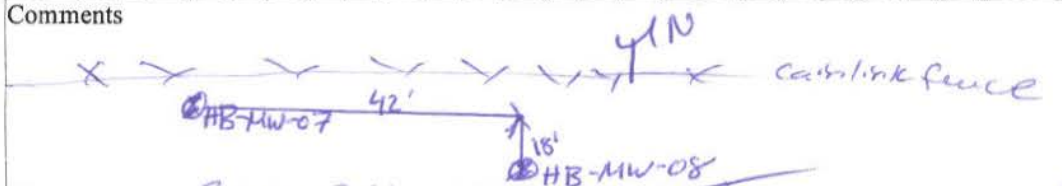
FIELD BORING LOG

BORING ID: HB-MW-08

LEA Comm. No.	**88UT136.001**		Page 4 of 5
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring		Date 8/2/12
Location	P&W East Hartford	GPS Latitude	
Client	Pratt & Whitney Division - JTot	GPS Longitude	
Drilling Method	Direct Push	Drilling Contractor	LEA
Sampling Method	Macro	Drill Foreman	J. Corcoran
Groundwater Depth	at	Drill Rig	GP 97 5400

Elevation/ Depth	Sample Information: Sample Number(s)	Recovery (% or n/n)	Blows/6" / Downforce	Time	PID/FID (ppm)	Mass	Description of Recovered Material (Color, primary grain size and amount, other grain size(s) and amounts, density, moisture, coherence, structure, sorting, other characteristics)
0	NT	100		1500	0.0		Br f-~~f~~ SAND 1.7ft Brick and Concrete ~~loose~~ f-~~f~~-M Overall loose Moist
2		100		1510	0.0		AA
4		100		1526	0.0		AA
6		100		1538	0.1		AA
8		37/48		1545	0.2		LT Br f-M SAND HC Sand loose WET @9'
10				1548	0.0		Br f-C SAND tr Silt loose WET
12		32/48		1550	0.1		AA
14				1553	0.0		AA
16	NT	24/24		1600	0.1		AA
18							BOB 18'

Comments



Waste Container 8260694 Trip Blank ID(s) Cooler ID

Field Personnel Volker, Corcoran

Signature

5 of 5

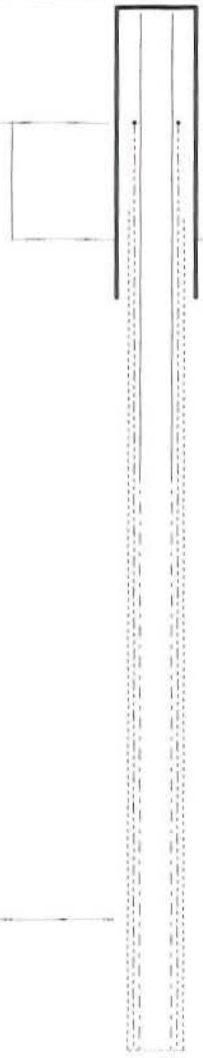
WELL COMPLETION REPORT

Project: UTC P&WEH 2011 F&H Bldgs GW Monitoring
LEA Comm. No. 88UT136.001
Client Pratt & Whitney Division - JTot
Location P&W East Hartford

Start Date 8/2/12
End Date 8/2/12
Well ID HB ~~FH~~-MW-05

Drilling Contractor LEA
Drilling Method Direct Push
Sampling Method Macro
Groundwater Observation
Depth ____ **at** ____ **Hours**

Logged by K. Wolkert
Drilling Foreman J. Corcoran
Drill Rig GP97
GPS Latitude
GPS Longitude



Protector
- Material: Boot box
- Diameter: 6"
- Length: 8" Ground
- Stickup:
- Key #:
- Cover Type:

Top Seal
- Top:
- Bottom:
- Material:

Backfill
- Top:
- Bottom:
- Material:

Secondary Sand
- Top: 4'
- Bottom: 17'
- Size: Zero Sand

Filter Pack
- Top: 7'
- Bottom: 17'
- Material: Prepack

Reported depth to bottom of boring: 18'

Comments

Concrete
- Diameter: 2x2
- Thickness: 18"

Reference
- Stickup:
- Description:

Casing
- Diameter: 1.5"
- Material: Sch 40 PVC
- Length: 7'
- Stickup: ~~0~~

Seal
- Top: Surface
- Bottom: 4'
- Material: Bentonite Chips

Screen
- Top: 7'
- Bottom: 17'
- Material: Sch 40 prepack
- Diameter: 1.5"
- Length: 10'
- Slot Size: 10

Miscellaneous Materials (Quantity Used/Item)
- Cement: 1 bag
- Bentonite Chips: 1/2 bag
- Bentonite Pellets:
- Bentonite Powder:
- Grout Weight:
- Filter Pack Sand: 1 bag
- Capping Sand:
- Well Point: 1
- Well Plug: 1

Signature

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DAILY FIELD REPORT

LEA Comm. No.	**88UT136.001**
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring
Location	P&W East Hartford, East Hartford, CT
Client	Pratt & Whitney Division - JTot

Date 8/3/12

Arrived at Site 8:00 Departed from Site 10:15 Vehicle Personal

Odometer (Start) 50 miles RT Return

Site Activities

- [ ] Soil Sampling
- [ ] Groundwater Sampling
- [ ] Surface Water Sampling
- [ ] Vapor/Air Sampling
- [ ] Concrete Sampling
- [ ] Other Sampling
- [ ] Other Sampling
- [x] Well Development
- [ ] Geoprobe Work
- [ ] Concrete Coring
- [ ] Construction
- [ ] Waste Management
- [ ] Inspection
- [ ] Site Walk Over
- [ ] Surveying
- [ ] Other (Describe)

Current Project Information

Last Sample Number Used	
Last Location ID Used	
Current Location (if not complete)	Field
Sampling for	
Laboratories used	
Paperwork & Equipment left at/in	office
Site Contact	
Contractors on Site	LSA
Time and place to meet contractors	

Non-productive Time

- [x] None
- [ ] Equipment Breakdown
- [ ] Late
- [ ] Weather
- [ ] Missing Equipment
- [ ] Other (Describe)

Quality Assurance Checks

	Yes	N/A	No
Sample labels complete		✓	
Sample/cooler seals OK		✓	
All samples obtained	✓		
Chains of custody	✓		
All forms/logs complete	✓		
Site condition OK	✓		
Site H&S Plan on site	✓		
Instruments calibrated	✓		

Residuals Disposition

Item	Approx. Amount	Container ID
Soil/Solid		
Groundwater	4 5 gallons	826071
Decon Fluid		
PPE		
Other		

Weather Conditions

Temperature 97 Precipitation None Wind Slight

Comments

Checked By

HP

Expendable Items Used

Qty	Item	LEA Number
	Bailer, Disposable (specify size)	090
	Cap, PVC, 1", (Threaded or FJT)	147
	Cap, PVC,1', Slip (S447010)	146
	Concrete, 60 lb. Bag	085
	Decontamination Supplies	081
	Drum, Closed Top 55 Gallon	086
	Drum, Open Top 55 Gallon	086
	Filter, Zap Cap	024
	Grout mix, bag	237
	Locks, Monitoring Well	155
1	Miscellaneous Health & Safety Items	060
	Plug, Locking, 2"	233
	Sand, Filter Pack, Bags	220
	Water, Distilled	025
	Well Point, 1" Sch 80 (FJT or ?)	216
	Well Protector, Roadbox, 4"	135

Equipment Used

Qty	Item	LEA Number
1	Meter, pH/Temp	021
1	Miscellaneous Small Tools & Equipment	152
	Pump, Grundfos	073
1	Pump, Peristaltic (spec. Master or Isco)	040
	Pump, Submersible	201
	Pump, Watera	038
	Thermo-Anemometer	248
1	Turbidimeter	023
	VOC Analyzer, Photovac 2020 (PID)	012
1	Water Level Indicator	028

Field Personnel Jeremy Corcoran

Keith Volkert

Signature

MW07 14

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DAILY FIELD REPORT

Supplemental Sheet

LEA Comm. No.	**88UT136.001**	Page 2 of 4
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 8/3/12
Location	P&W East Hartford, East Hartford, CT	
Client	Pratt & Whitney Division - JTot	

Description of Site Activities

800 - on site
- start Developing well SH-MW-08
930 - finish Developing well
- Complete well Pad
1015 - off site

Field Personnel	Jeremy Corcoran	***Signature***
	Keith Volkert	

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DAILY FIELD REPORT
CALIBRATION RECORD

LEA Comm. No.	**88UT136.001**
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring
Location	P&W East Hartford, East Hartford, CT
Client	Pratt & Whitney Division - JTot

Date 5/31/12

pH Meter/Serial # 09210041

	Time	pH 4.01	pH 7.00	pH 10.01	Spec. Cond.	ORP	DO
Initial Calibration	830	4	7	10	1001	100	98%
Calibration Check							
Calibration Check							

Turbidity Meter/Serial # 3520

	Time	0 NTU	20 NTU	100 NTU	800 NTU
Initial Calibration	900	0	20	100	800
Calibration Check					
Calibration Check					

PID Meter/Serial #

	Time	Standard	Meter Reading	Zero with
Initial Calibration				
Calibration Check				
Calibration Check				

Balance/Serial #

	Time	Standard	Balance
Initial Calibration			
Calibration Check			
Calibration Check			

Comments

Field Personnel	Jeremy Corcoran	
	Keith Volkert	

Signature

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FIELD SAMPLING RECORD
WELL DEVELOPMENT

LEA Comm. No.	**88UT136.001**
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring
Location	P&W East Hartford, East Hartford, CT
Client	Pratt & Whitney Division - JTot

Date 8/3/12

Time :

Monitoring Well Number EHF-MW-08 Sample Number(s)

Initial Field Data and Measurements

Depth of Well	16.90	Reference Used	TOR		
Depth to Water	9.74	PID/FID Reading			
Height of Column	7.16	Interface	Yes / No	If yes, Depth	NA Lighter / Heavier

Well Casing Diameter 1.5 Material PVC

Protector Road Box / Stickup

Ground to Reference

Comments one well volume = 0.65 gallons

General Condition	OK	Bad
Casing Secure	✓	
Collar Intact	✓	
Cover Locked	✓	
Other (describe)		

Development Information

Purge Volume Factors
- *0.5" - 0.01*
- *1" - 0.041*
- *1.5" - 0.091*
- *2" - 0.16*
- *4" - 0.65*
- *6" - 1.5*

Volumes \ Parameter	Gallons	Temp (C)	pH (SU)	Spec.Con.	Turbidity	Other
Initial 0	0	21.80	6.47	605	1000+	
1	1	21.70	6.42	661	5.85	
2	2	21.64	6.41	678	4.30	
4	3	21.57	6.42	671	3.72	

Initial Sample Observations

Clear	
Colored	
Cloudy	
Turbid	X
Odor	
Sheen	

Developement Method ~~Peristaltic Pump~~ / Bailer / Inertial Pump / Other

Field Decontamination? ~~Yes~~ / No If Yes, with what?

Waste Container ID 82000491

Additional Comments

Field Personnel ~~Jeremy Corcoran~~ Keith Volkert

Signature

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DAILY FIELD REPORT

LEA Comm. No.	**88UT136.001**	Page 1 of 7	
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 9/6/12	
Location	P&W East Hartford, East Hartford, CT		
Client	Pratt & Whitney Division - JTot		

Arrived at Site 0835 Departed from Site 1400 Vehicle Personal

Odometer (Start) _____ Return ~160 miles RT

Site Activities

	Soil Sampling		Geoprobe Work		
X	Groundwater Sampling		Concrete Coring		
	Surface Water Sampling		Construction		
	Vapor/Air Sampling		Waste Management		
	Concrete Sampling				
	Other Sampling	X	Inspection		
	Other Sampling		Site Walk Over		
			Surveying		
	Well Development		Other (Describe)		

Current Project Information

Last Sample Number Used	
Last Location ID Used	
Current Location (if not complete)	
Sampling for	See C.O.C.
Laboratories used	Accutest
Paperwork & Equipment left at/in	Office
Site Contact	Paul I
Contractors on Site	LEA
Time and place to meet contractors	N/A

Non-productive Time

X	None		Weather
	Equipment Breakdown		Missing Equipment
	Late		Other (Describe)

Quality Assurance Checks

Yes	N/A	No	
/			Sample labels complete
/			Sample/cooler seals OK
/			All samples obtained
/			Chains of custody
/			All forms/logs complete
/			Site condition OK
/			Site H&S Plan on site
/			Instruments calibrated

Residuals Disposition

Item	Approx. Amount	Container ID
Soil/Solid	N/A	N/A
Groundwater	~2 gall	826091
Decon Fluid		
PPE		
Other		

Weather Conditions

Temperature ~75°F Precipitation None Wind Light

Comments: Light mist in morning

Checked By

Expendable Items Used

Qty	Item	LEA Number
	Bailer, Disposable (specify size)	090
1	Decontamination Supplies	081
	Drum, Closed Top 55 Gallon	086
	Filter, In Line	024
1	Miscellaneous Health & Safety Items	060
~50'	Tubing, 1/2", NOS	007
	Tubing, 3/8", NOS	008
	Water, Distilled	025

Equipment Used

Qty	Item	LEA Number
	Generator 3500 Watt	153
	Meter, Conductivity	022
	Meter, pH/Temp	021
1	Miscellaneous Small Tools & Equipment	152
	Pump, Grundfos	073
1	Pump, Peristaltic (spec. Master or Isco)	040
	Pump, Submersible	201
	Pump, Watera	038
	Thermo-Anemometer	248
1	Turbidimeter	023
	VOC Analyzer, Photovac 2020 (PID)	012
1	Water Level Indicator	028
1	Water Quality Meter w/Flow Cell	070

Field Personnel Jeremy Marcantonio *Signature*

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DAILY FIELD REPORT

Supplemental Sheet

LEA Comm. No.	**88UT136.001**	Page 2 of 7
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 9/6/12
Location	P&W East Hartford, East Hartford, CT	
Client	Pratt & Whitney Division - JTot	

Description of Site Activities

0835 - LEA on site; begin prepping bottles; calibrate equipment
0915 - Begin locating wells before getting water level measurements
0925 - HB-MW-04 is missing - covered and paved over when P&W built "Contractor Sign-In Parking" area
1235 - Decon equipment
1255 - Begin SEHR inspections
1345 - Relinquish samples to LEA staff at Willow Pond
1400 - LEA offsite

JT

Field Personnel Jeremy Marcantonio

Signature

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DAILY FIELD REPORT
CALIBRATION RECORD

LEA Comm. No.	**88UT136.001**	Page 3 of 7	
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 9/10/12	
Location	P&W East Hartford, East Hartford, CT		
Client	Pratt & Whitney Division - JTot		

pH Meter/Serial # 05E1041041

	Time	pH 4.01	pH 7.00	pH 10.01	Spec. Cond.	ORP	DO
Initial Calibration	0845	4.00	7.00	10.00	1000	100	100
Calibration Check							
Calibration Check							

Turbidity Meter/Serial # 2253

	Time	0 NTU	20 NTU	100 NTU	800 NTU
Initial Calibration	0855	0.0	20.0	100	800
Calibration Check					
Calibration Check					

PID Meter/Serial # 38160

	Time	Standard	Meter Reading	Zero with
Initial Calibration	0905	0.0	0.0	Ambient Air
Calibration Check	0908	100	100	Isobutylene
Calibration Check				

Balance/Serial #

	Time	Standard	Balance
Initial Calibration			
Calibration Check			
Calibration Check			

Comments

Field Personnel: Jeremy Marcantonio

Signature

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FIELD SAMPLING RECORD
MISCELLANEOUS SAMPLES

LEA Comm. No.	**88UT136.001**	Page 4 of 7	
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 9/6/12	
Location	P&W East Hartford, East Hartford, CT		
Client	Pratt & Whitney Division - JTot		

Sample ID	Location ID	Time	Sample Type	Depth (ft)	PID/FID Reading	Comments	Waste Cont. ID
12603259	Trip Blank	0910	BKT	/	/	GW Trip Blank	/
12603258(LF)	Equipment Blank	1240	BKE	/	/	GW Equipment Blank	/
12603257(LF)	HB-MW-08	1217	GW	/	0.1	GW Duplicate sample of 12603256(LF)	8[illegible]0091

Field Personnel Jeremy Marcantonio

Signature

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FIELD SAMPLING RECORD
MONITORING WELL INVENTORY

LEA Comm. No.	**88UT136.001**		Page 5 of 7
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring		Date 9/6/12
Location	P&W East Hartford, East Hartford, CT		
Client	Pratt & Whitney Division - JTot		

Sample ID	Location ID	Time	Predicted Depth of Well	Predicted Depth to Water	Actual Depth of Well	Actual Depth to Water	PID/FID	Reference Elevation	Comments
2237993	FB-MW-01	0945			9.48	DRY	0.0		
2237994	FB-MW-02	0935			13.61	9.19	0.0		
2237995	HB-MW-04	0940			NM	NM	NM		Missing – Paved Over
2237996	HB-MW-05	0950			14.66	10.48	0.0		
2237997	HB-MW-06	0955			13.61	9.17	0.0		
2237998	HB-MW-07	1009			14.48	10.02	0.1		
2237999	HB-MW-08	1003				9.62	0.1		
~~2238000~~									

Field Personnel Jeremy Marcantonio *Signature*

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FIELD SAMPLING RECORD
LOW FLOW WELL SAMPLE

LEA Comm. No.	**88UT136.001**	Page 6 of 7
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 9/6/12
Location	P&W East Hartford, East Hartford, CT	Sample Time 11:07
Client	Pratt & Whitney Division - JTot	

Monitoring Well Number HB-MW-07 Sample Number(s) 1263255 1263255uf

Initial Field Data and Measurements

Depth of Well 14.48 Reference Used TOC
Depth to Water 10.02 PID/FID Reading 0.1
Height of Column 4.46 Interface Yes (No) If yes, Depth _____ Lighter / Heavier

Well Casing Diameter 1.5" Material PVC

Protector (Road Box) / Stickup
Ground to Reference TOC
Comments _____

General Condition	OK	Bad
Casing Secure	X	
Collar Intact	X	
Cover Locked	X	
Other (describe)		

Development Information

Time / Parameter	Depth to Water	Pump Setting	Purge Rate (mL/min)	Cum. Liters Purged (L)	Temp (C) 3%	Spec. Cond. (uS/cm) 3%	pH (SU) 0.1	ORP (Eh) 10	DO (mg/L) 10%	Turbidity (NTU) 25	Comment
1020	10.02	180	100	0							Purging
1030	10.04	180	100	1	21.49	546	6.29	34.3	0.69	9.83	
1040	10.04	180	100	2	21.47	566	6.25	32.2	0.22	6.40	
1050	10.05	180	100	3	21.58	594	6.24	26.6	0.18	5.07	
1055	10.05	180	100	3.5	21.59	599	6.24	29.0	0.18	4.74	
1100	10.05	180	100	4	21.55	611	6.24	32.8	0.18	4.18	
1105	10.05	180	100	4.5	21.56	615	6.24	34.0	0.18	3.89	
1107	SAMPLE										

Developement Method (Peristaltic Pump) / Bailer / Inertial Pump / Other

Sample Field Treatment *If any ambiguity could exist, be sure to indicate the field treatment applied to each sample aliquot with the appropriate suffix in the sample ID on both the sample bottle label and on the Chain of Custody!*

Field Decontamination? (Yes) / No If Yes, with what? DI → MeOH wipe on WL
Waste Container ID 82600491

Additional Comments DTB taken after sampling

Field Personnel Jeremy Marcantonio ***Signature***

Loureiro

Engineering • Construction • EH&S • Energy • Waste

FIELD SAMPLING RECORD
LOW FLOW WELL SAMPLE

LEA Comm. No.	**88UT136.001**	Page 7 of 7
Project	UTC P&WEH 2011 F&H Bldgs GW Monitoring	Date 9/20/12
Location	P&W East Hartford, East Hartford, CT	Sample Time 12 : 17
Client	Pratt & Whitney Division - JTot	

Monitoring Well Number HB-MW-08 Sample Number(s) 1263256 1263257 1263257 DF 1263256DF

Initial Field Data and Measurements

Depth of Well	16.76	Reference Used	TOC		
Depth to Water	9.62	PID/FID Reading	0.1		
Height of Column	7.14	Interface	Yes / (No)	If yes, Depth	Lighter / Heavier

Well Casing Diameter 1.5" Material PVC

Protector (Road Box) / Stickup

Ground to Reference TOC

Comments (GW)

General Condition	OK	Bad
Casing Secure	X	
Collar Intact	X	
Cover Locked	Y	
Other (describe)		

Development Information

Time \ Parameter	Depth to Water	Pump Setting	Purge Rate (mL/min)	Cum. Liters Purged (L)	Temp (C) 3%	Spec. Cond. (uS/cm) 3%	pH (SU) 0.1	ORP (Eh) 10	DO (mg/L) 10%	Turbidity (NTU) 25	Comment
1140	9.62	160	100	0							Purging
1150	9.62	150	100	1	23.82	579	6.30	40.4	1.32	6.81	
1200	9.62	150	100	2	23.76	636	6.28	41.1	1.18	4.73	
1205	9.62	150	100	2.5	23.68	648	6.27	41.5	1.08	4.11	
1210	9.62	150	100	3	23.69	657	6.29	42.1	1.13	3.60	
1215	9.62	150	100	3.5	23.69	666	6.26	42.8	1.09	3.12	
1217	SAMPLE										

(GW)

Developement Method (Peristaltic Pump) / Bailer / Inertial Pump / Other

Sample Field Treatment *If any ambiguity could exist, be sure to indicate the field treatment applied to each sample aliquot with the appropriate suffix in the sample ID on both the sample bottle label and on the Chain of Custody!*

Field Decontamination? (Yes) No If Yes, with what? DI -> MeOH wipe on WL

Waste Container ID 826091

Additional Comments DTB taken after sampling.

Field Personnel Jeremy Marcantonio ***Signature***

CHAIN OF CUSTODY

PAGE 1 of 1

ACCUTEST LABORATORIES

Accutest Laboratories of New England
495 Technology Center West, Building One
TEL. 508-481-6200 FAX: 508-481-7753
www.accutest.com

FED-EX Tracking #: | Bottle Order Control #:

Accutest Quote #: FDI2012-218 | Accutest Job #:

Client / Reporting Information

Company Name: Lovering Engineering Assoc
Street Address: 100 Northwest Drive
City / State / Zip: Plainville CT 06062
Project Contact / E-mail: Robin McKinney
Phone # / Fax #: 860-747-6181
Sampler(s) Name(s) / Phone #: J. Marcantonio

Project Information

Project Name: LTC P-WEH F&H Buildings GW
Street: Wilson St.
City: East Hartford, CT
Project#: 88UT136
Client PO#:
Project Manager: Dave Fierick

Billing Information (If different from Report to)

Company Name:
Street Address:
City / State / Zip:
Attention: PO#:

Requested Analysis (see TEST CODE sheet)

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL - Sludge; SED-Sediment; OI - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB-Field Blank; EB- Equipment Blank; RB- Rinse Blank; TB-Trip Blank

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	Bisulfate	VOCs 8260B	CT ETPH	PCBs 8082	TOTAL RCRA 8 + Cu, Ni, Zn	HOLD	LAB USE ONLY
	1263259		6/6/12	0910	JM	TB	1	1									X					
	1263258		6/6/12	1240	JM	GW	6	2				4					X	X	X			
	1263258UF		6/6/12	1240	JM	GW	1			1										X		
	1263255		6/6/12	1107	JM	GW	6	2				4					X	X	X			
	1263255UF		6/6/12	1107	JM	GW	1			1										X		
	1263256		6/6/12	1217	JM	GW	6	2				4					X	X	X			
	1263256UF		6/6/12	1217	JM	GW	1			1										X		
	1263257		6/6/12	1217	JM	GW	6	2				4					X	X	X			
	1263257UF		6/6/12	1217	JM	GW	1			1										X		

Turnaround Time (Business days)

- [ ] Std. 10 Business Days
- [x] Std. 5 Business Days (By Contract only)
- [ ] 5 Day *RUSH*
- [ ] 3 Day *EMERGENCY*
- [ ] 2 Day *EMERGENCY*
- [ ] 1 Day *EMERGENCY*

Emergency & Rush T/A data available VIA Lablink

Approved By (Accutest PM): / Date:

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [x] CT RCP
- [ ] MA MCP
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary

Comments / Special Instructions

Provide CT RCP Report

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1		6/6/2012 1615		2		2
3				4		4
5				Custody Seal #	Intact / Not Intact	Preserved where applicable / On Ice / Cooler Temp.

Appendix D

Laboratory Reports

New England ACCUTEST LABORATORIES

02/09/12

Technical Report for

Loureiro Eng. Associates

PWCTEH:F & H Buildings Groundwater

88UT136

Accutest Job Number: MC7631

Sampling Date: 01/31/12

Report to:

Loureiro Eng
100 Northwest Drive
Plainville, CT 06062
rlmckinney@loureiro.com; jttrzaski@loureiro.com

ATTN: Joe Traski

Total number of pages in report: **25**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Reza Tand
Lab Director

Client Service contact: Frank DAgostino 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) ISO 17025:2005 (L2235)

Sections: 1 2 3 4 5 6

Table of Contents

Sample Summary

Loureiro Eng. Associates

Job No: MC7631

PWCTEH:F & H Buildings Groundwater
Project No: 88UT136

Sample Number	Collected Date	Time	By	Received	Matrix Code	Matrix Type	Client Sample ID
MC7631-1	01/31/12	13:32	KD	01/31/12	AQ	Ground Water	1249871UF

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Loureiro Eng. Associates	**Job No**	MC7631
Site:	PWCTEH:F & H Buildings Groundwater	**Report Date**	2/9/2012 2:52:47 PM

1 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were collected on 01/31/2012 and were received at Accutest on 01/31/2012 properly preserved, at 0.9 Deg. C and intact. These Samples received an Accutest job number of MC7631. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Metals By Method SW846 6010C

Matrix: AQ **Batch ID:** MP18522

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC7707-12FSDL were used as the QC samples for metals.
- Only Chromium requested.

Wet Chemistry By Method SW846 7196A

Matrix: AQ **Batch ID:** GN37725

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC7631-1DUP, MC7631-1MS were used as the QC samples for Chromium, Hexavalent.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC7631).

New England ACCUTEST LABORATORIES

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	1249871UF		
Lab Sample ID:	MC7631-1	**Date Sampled:**	01/31/12
Matrix:	AQ - Ground Water	**Date Received:**	01/31/12
		Percent Solids:	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Chromium	27.4	10	ug/l	1	02/03/12	02/03/12	EAL	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: MA13913
(2) Prep QC Batch: MP18522

RL = Reporting Limit

Report of Analysis

Client Sample ID:	1249871UF		
Lab Sample ID:	MC7631-1	**Date Sampled:**	01/31/12
Matrix:	AQ - Ground Water	**Date Received:**	01/31/12
		Percent Solids:	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chromium, Hexavalent	< 0.010	0.010	mg/l	1	02/01/12 12:05	MC	SW846 7196A

RL = Reporting Limit

New England ACCUTEST LABORATORIES

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Certification Exceptions
- Certification Exceptions (CT)
- Chain of Custody
- RCP Form
- Sample Tracking Chronicle

ACCUTEST LABORATORIES

CHAIN OF CUSTODY

Accutest Laboratories of New England
495 Technology Center West, Building One
TEL. 508-481-6200 FAX: 508-481-7753
www.accutest.com

PAGE 1 OF 1

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL - Sludge; SED - Sediment; OL - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB - Field Blank; EB - Equipment Blank; RB - Rinse Blank; TB - Trip Blank

Client / Reporting Information	Project Information	Billing Information (If different from Report to)
Company Name: Loureiro Engineering Associates	Project Name: PW EHF 311 Buildings GW monitoring	Company Name:
Street Address: 100 Northwest Drive	Street: Willow Street	Street Address:
City, State, Zip: Plainville, CT 06062	City: East Hartford	City, State, Zip:
Project Contact, E-mail: Robin McKinney	Project #: 18UT136	
Phone #, Fax #: 860-747-6181	Client PO#:	
Sampler(s) Name(s), Phone #: K. DOnofrio	Project Manager:	Attention: PO#

Requested Analysis (see TEST CODE sheet): Total Chlorinated Hydrocarbons (8260)

Accutest Sample #	Field ID / Point of Collection	MATRIX Code	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl, NaOH, NONE, DI Water, H2SO4, ENCORE, Bisulfate	LAB USE ONLY
1	12-19871 MW		11/2/12	1332	KD	GW	2	1	

Turnaround Time (Business days):
- [ ] Std. 10 Business Days
- [ ] Std. 5 Business Days (By Contract only)
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY

Emergency & Rush T/A data available VIA Labnet

Approved By (Accutest PM) / Date:

Data Deliverable Information:
- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [x] CT RCP
- [ ] MA MCP
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary

Comments / Special Instructions: Provide RCP Report (KM)

REVISED 2/11/13 MF

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler	Date Time	Received By	Relinquished By	Date Time	Received By
1	11-2-12	1	2		2
Relinquished by Sampler	Date Time	Received By	Relinquished By	Date Time	Received By
3		3	4		4
Relinquished By	Date Time	Received By	Custody Seal #	Intact / Not Intact	Preserved where applicable	On Ice	Cooler Temp.
5		5					

MC7631: Chain of Custody
Page 1 of 3

CHAIN OF CUSTODY

ACCUTEST LABORATORIES

Accutest Laboratories of New England
495 Technology Center West, Building One
TEL. 508-481-6200 FAX: 508-481-7753
www.accutest.com

PAGE 1 OF 1

FED-EX Tracking #: | Bottle Order Control #:
Accutest Quote #: F01202-218 | Accutest Job #: MC7631

Client / Reporting Information

Company Name: Loureiro Engineering Associates
Street Address: 100 Northwest Drive
City: Plainville | State: CT | Zip: 06062
Project Contact: Robin McKinney | E-mail:
Phone #: 860-747-6181 | Fax #:
Sampler(s) Name(s): K. DOnofrio | Phone #:

Project Information

Project Name: P3W EHF3H Buildings GW Monitoring
Street: Willow Street
City: East Hartford
Project#: 88UT136
Client PO#:
Project Manager:

Billing Information (If different from Report to)

Company Name:
Street Address:
City | State | Zip:
Attention: | PO#:

Requested Analysis (see TEST CODE sheet)

Total Chromium
Hexavalent Chromium

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL - Sludge
SED-Sediment
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid
WP - Wipe
FB-Field Blank
EB- Equipment Blank
RB- Rinse Blank
TB-Trip Blank

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	Bisulfate	Total Chromium	Hexavalent Chromium	LAB USE ONLY
1	1249871		1/31/12	1332	KD	GW	2			1		(X)					X	X	

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] CT RCP
- [ ] MA MCP
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary

Comments / Special Instructions

11D, 6D

Turnaround Time (Business days)

Approved By (Accutest PM): / Date:

- [x] Std. 10 Business Days
- [ ] Std. 5 Business Days (By Contract only)
- [ ] 5 Day *RUSH*
- [ ] 3 Day *EMERGENCY*
- [ ] 2 Day *EMERGENCY*
- [ ] 1 Day *EMERGENCY*

Emergency & Rush T/A data available VIA Lablink

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	Kevin DOnofrio	1-31-12 1515	B. Cahill	BC	1-31-12 1915	BC
2	Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
	BC		I			
3	Relinquished by:	Date Time:	Received By:	Custody Seal #	Intact / Not intact	Preserved where applicable
4						On Ice: Cooler Temp. 0.9°
5						

MC7631: Chain of Custody
Page 2 of 3

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC7631 **Client:** LEA **Immediate Client Services Action Required:** No

Date / Time Received: 1/31/2012 **Delivery Method:** **Client Service Action Required at Login:** No

Project: 88UT136 **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	Infared gun		
3. Cooler media:	Ice (bag)		

Quality Control Preservatio	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

Accutest Laboratories
V:508.481.6200

495 Technology Center West, Bldg One
F: 508.481.7753

Marlborough, MA
www/accutest.com

MC7631: Chain of Custody
Page 3 of 3

Reasonable Confidence Protocol
Laboratory Analysis
QA/QC Certification Form

Laboratory Name: **Accutest New England** **Client:** **Loureiro Eng. Associates**

Project Location: **PWCTEH:F & H Buildings Groundwater** **Project Number:** **88UT136**

Sampling Date(s): **1/31/2012**

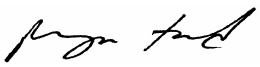
Laboratory Sample ID(s): MC7631-1

Methods: SW846 6010C, SW846 7196A

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the CTDEP method-specific Reasonable Confidence Protocol documents)?	Yes ☑ No ☐
1A	Where all the method specified preservation and holding time requirements met?	Yes ☑ No ☐
1B	VPH and EPH mehods only: Was the VPH or EPH method conducted without significant modifications (See section 11.3 of respective methods)	Yes ☐ No ☐ NA ☑
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes ☑ No ☐
3	Were samples received at an appropriate temperature (<6° C)?	Yes ☑ No ☐
4	Were all QA/QC performance criteria specified in the CTDEP Reasonable Confidence Protocol documents achieved?	Yes ☑ No ☐
5	a) Were reporting limits specified or referenced on the chain-of-custody?	Yes ☐ No ☑
	b) Were these reporting limits met?	Yes ☐ No ☑
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the Reasonable Confidence Protocol documents?	Yes ☐ No ☑
7	Are project-specific matrix spikes and laboratory duplicates included in this data set?	Yes ☑ No ☐

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1A or #1B is "No", the data package does not meet the requirements for "Reasonable Confidence".

I, the undersigned, attest under pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete.

Authorized Signature: 

Position: Lab Director

Printed Name: Reza Tand
Accutest New England

Date: 2/9/2012

Internal Sample Tracking Chronicle

Loureiro Eng. Associates

Job No: MC7631

PWCTEH:F & H Buildings Groundwater
Project No: 88UT136

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC7631-1	Collected: 31-JAN-12 13:32 By: KD		Received: 31-JAN-12 By: JB			
1249871UF						
MC7631-1	SW846 7196A	01-FEB-12 12:05	MC			XCR
MC7631-1	SW846 6010C	03-FEB-12 18:06	EAL	03-FEB-12	DA	CR

New England ACCUTEST LABORATORIES

Metals Analysis

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP18522
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 02/03/12

Metal	RL	IDL	MDL	MB raw	final
Aluminum	200	12	21		
Antimony	6.0	1.1	1.7		
Arsenic	4.0	.88	1.9		
Barium	50	.24	.65		
Beryllium	4.0	.15	.28		
Boron	100	.39	.59		
Cadmium	4.0	.12	.17		
Calcium	5000	5.8	17		
Chromium	10	.65	.7	0.10	<10
Cobalt	50	.13	.38		
Copper	25	.48	1.4		
Gold	50	2	2.7		
Iron	100	3.5	11		
Lead	5.0	1.3	2.1		
Magnesium	5000	34	60		
Manganese	15	.15	.54		
Molybdenum	100	.53	1.5		
Nickel	40	.22	.7		
Palladium	50	3.2	7.9		
Platinum	50	6.4	9.6		
Potassium	5000	42	190		
Selenium	10	1.5	2		
Silicon	100	1.1	8.4		
Silver	5.0	.71	1.3		
Sodium	5000	14	40		
Strontium	10	.19	.35		
Thallium	5.0	.71	1.4		
Tin	100	.43	.6		
Titanium	50	.46	.72		
Tungsten	100	6.9	14		
Vanadium	10	.7	1.3		
Zinc	20	1.2	4		

Associated samples MP18522: MC7631-1

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP18522 Methods: SW846 6010C
Matrix Type: AQUEOUS Units: ug/l

Prep Date:

Metal

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP18522
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 02/03/12 02/03/12

Metal	BSP Result	Spikelot MPICP	% Rec	QC Limits	BSD Result	Spikelot MPICP	% Rec	BSD RPD	QC Limit
Aluminum									
Antimony									
Arsenic	anr								
Barium	anr								
Beryllium									
Boron									
Cadmium	anr								
Calcium									
Chromium	506	500	101.2	80-120	508	500	101.6	0.4	20
Cobalt									
Copper	anr								
Gold									
Iron	anr								
Lead	anr								
Magnesium									
Manganese	anr								
Molybdenum									
Nickel	anr								
Palladium									
Platinum									
Potassium									
Selenium	anr								
Silicon									
Silver	anr								
Sodium									
Strontium									
Thallium									
Tin									
Titanium									
Tungsten									
Vanadium									
Zinc	anr								

Associated samples MP18522: MC7631-1

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP18522
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date:

Metal

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SERIAL DILUTION RESULTS SUMMARY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP18522
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 02/03/12

Metal	MC7707-12F Original	SDL 1:5	%DIF	QC Limits
Aluminum				
Antimony				
Arsenic	anr			
Barium	anr			
Beryllium				
Boron				
Cadmium	anr			
Calcium				
Chromium	0.00	0.00	NC	0-10
Cobalt				
Copper	anr			
Gold				
Iron	anr			
Lead	anr			
Magnesium				
Manganese	anr			
Molybdenum				
Nickel	anr			
Palladium				
Platinum				
Potassium				
Selenium	anr			
Silicon				
Silver	anr			
Sodium				
Strontium				
Thallium				
Tin				
Titanium				
Tungsten				
Vanadium				
Zinc	anr			

Associated samples MP18522: MC7631-1

SERIAL DILUTION RESULTS SUMMARY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP18522
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date:

Metal

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

New England ACCUTEST LABORATORIES

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Chromium, Hexavalent	GN37725	0.010	0.0	mg/l	0.1	0.10	100.0	85-115%

Associated Samples:
Batch GN37725: MC7631-1
(*) Outside of QC limits

BLANK SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Analyte	Batch ID	Units	Spike Amount	BSD Result	RPD	QC Limit
Chromium, Hexavalent	GN37725	mg/l	0.1	0.10	0.0	20%

Associated Samples:
Batch GN37725: MC7631-1
(*) Outside of QC limits

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Chromium, Hexavalent	GN37725	MC7631-1	mg/l	0.0	0.0	0.0	0-20%

Associated Samples:
Batch GN37725: MC7631-1
(*) Outside of QC limits

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: MC7631
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Chromium, Hexavalent	GN37725	MC7631-1	mg/l	0.0	0.1	0.094	94.0	85-115%

Associated Samples:
Batch GN37725: MC7631-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

New England ACCUTEST LABORATORIES

09/13/12

Technical Report for

Loureiro Eng. Associates

PWCTEH:F & H Buildings Groundwater

88UT136

Accutest Job Number: MC13780

Sampling Date: 09/06/12

Report to:

Loureiro Eng
100 Northwest Drive
Plainville, CT 06062
rlmckinney@loureiro.com; jttrzaski@loureiro.com

ATTN: Joe Traski

Total number of pages in report: **67**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Reza Tand
Lab Director

Client Service contact: Frank DAgostino 508-481-6200

Certifications: MA (M-MA136,SW846 NELAC) CT (PH-0109) NH (250210) RI (00071) ME (MA00136) FL (E87579) NY (11791) NJ (MA926) PA (6801121) ND (R-188) CO MN (11546AA) NC (653) IL (002337) WI (399080220) ISO 17025:2005 (L2235)

Sections: 1 2 3 4 5 6 7 8

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Accutest Laboratories

Sample Summary

Loureiro Eng. Associates

Job No: MC13780

PWCTEH:F & H Buildings Groundwater
Project No: 88UT136

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
MC13780-1	09/06/12	09:10	JM	09/06/12	AQ	Trip Blank Water	1263259
MC13780-2	09/06/12	12:40	JM	09/06/12	AQ	Ground Water	1263258
MC13780-3	09/06/12	12:40	JM	09/06/12	AQ	Ground Water	1263258UF
MC13780-4	09/06/12	11:07	JM	09/06/12	AQ	Ground Water	1263255
MC13780-5	09/06/12	11:07	JM	09/06/12	AQ	Ground Water	1263255UF
MC13780-6	09/06/12	12:17	JM	09/06/12	AQ	Ground Water	1263256
MC13780-7	09/06/12	12:17	JM	09/06/12	AQ	Ground Water	1263256UF
MC13780-8	09/06/12	12:17	JM	09/06/12	AQ	Ground Water	1263257
MC13780-9	09/06/12	12:17	JM	09/06/12	AQ	Ground Water	1263257UF

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client: Loureiro Eng. Associates **Job No** MC13780

Site: PWCTEH:F & H Buildings Groundwater **Report Date** 9/13/2012 4:50:50 PM

8 Sample(s), 1 Trip Blank(s) were collected on 09/06/2012 and were received at Accutest on 09/06/2012 properly preserved, at 2.1 Deg. C and intact. These Samples received an Accutest job number of MC13780. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GCMS By Method SW846 8260B

Matrix: AQ **Batch ID:** MSP2103

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Blank Spike Recovery(s) for 1,2,4-Trichlorobenzene, 2,2-Dichloropropane, Naphthalene, Trans-1,4-Dichloro-2-Butene are outside control limits. Blank Spike meets program technical requirements.
- Continuing calibration check standard MSP2103-CC2072 for 2,2-dichloropropane, trans-1,4-dichloro-2-butene, 1,2,4-trichlorobenzene, naphthalene, 1,2,3-trichlorobenzene exceed 30% Difference. This check standard met RCP criteria.
- Quadratic regression is employed for initial calibration standard in batch MSP2072-ICC2072 for methyl tert butyl ether, carbon disulfide.

Extractables by GC By Method CT-ETPH 7/06

Matrix: AQ **Batch ID:** OP30303

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.

Extractables by GC By Method SW846 8082

Matrix: AQ **Batch ID:** OP30302

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- MC13780-2 for Decachlorobiphenyl: Outside control limits due to possible matrix interference.

Metals By Method SW846 6010C

Matrix: AQ **Batch ID:** MP19630

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC13777-15SDL were used as the QC samples for metals.
- RPD(s) for Serial Dilution for Chromium, Copper, Nickel are outside control limits for sample MP19630-SD1. Percent difference acceptable due to low initial sample concentration (< 50 times IDL).
- Only selected metals requested.

Metals By Method SW846 7470A

Matrix: AQ	Batch ID: MP19634

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.

Matrix: AQ	Batch ID: MP19637

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(MC13780).

Summary of Hits

Job Number: MC13780
Account: Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater
Collected: 09/06/12

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
MC13780-1	**1263259**					
No hits reported in this sample.						
MC13780-2	**1263258**					
No hits reported in this sample.						
MC13780-3	**1263258UF**					
No hits reported in this sample.						
MC13780-4	**1263255**					
CT-ETPH (C9-C36)		0.0830	0.080		mg/l	CT-ETPH 7/06
MC13780-5	**1263255UF**					
Barium		88.8	50		ug/l	SW846 6010C
MC13780-6	**1263256**					
1,1,1-Trichloroethane		4.8	1.0		ug/l	SW846 8260B
CT-ETPH (C9-C36)		0.0979	0.094		mg/l	CT-ETPH 7/06
MC13780-7	**1263256UF**					
Barium		69.9	50		ug/l	SW846 6010C
MC13780-8	**1263257**					
1,1,1-Trichloroethane		4.9	1.0		ug/l	SW846 8260B
MC13780-9	**1263257UF**					
Barium		69.5	50		ug/l	SW846 6010C

New England ACCUTEST LABORATORIES

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID: 1263259
Lab Sample ID: MC13780-1
Matrix: AQ - Trip Blank Water
Method: SW846 8260B
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P64428.D	1	09/11/12	TT	n/a	n/a	MSP2103
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
67-64-1	Acetone	ND	5.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	ug/l	
71-43-2	Benzene	ND	0.50	ug/l	
108-86-1	Bromobenzene	ND	5.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	2.0	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	ug/l	
75-15-0	Carbon disulfide	ND	5.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	2.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	2.0	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	5.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	ug/l	

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263259		
Lab Sample ID:	MC13780-1	**Date Sampled:**	09/06/12
Matrix:	AQ - Trip Blank Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
142-28-9	1,3-Dichloropropane	ND	5.0	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
76-13-1	Freon 113	ND	5.0	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	ug/l	
591-78-6	2-Hexanone	ND	5.0	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/l	
74-95-3	Methylene bromide	ND	5.0	ug/l	
75-09-2	Methylene chloride	ND	2.0	ug/l	
91-20-3	Naphthalene	ND	5.0	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	ug/l	
100-42-5	Styrene	ND	5.0	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
109-99-9	Tetrahydrofuran	ND	10	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
110-57-6	Trans-1,4-Dichloro-2-Butene	ND	5.0	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
	m,p-Xylene	ND	1.0	ug/l	
95-47-6	o-Xylene	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	115%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263259		
Lab Sample ID:	MC13780-1	**Date Sampled:**	09/06/12
Matrix:	AQ - Trip Blank Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
2037-26-5	Toluene-D8	104%		70-130%
460-00-4	4-Bromofluorobenzene	115%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263258
Lab Sample ID: MC13780-2
Matrix: AQ - Ground Water
Method: SW846 8260B
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P64441.D	1	09/12/12	TT	n/a	n/a	MSP2103
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
67-64-1	Acetone	ND	5.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	ug/l	
71-43-2	Benzene	ND	0.50	ug/l	
108-86-1	Bromobenzene	ND	5.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	2.0	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	ug/l	
75-15-0	Carbon disulfide	ND	5.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	2.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	2.0	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	5.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	ug/l	

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263258
Lab Sample ID: MC13780-2
Matrix: AQ - Ground Water
Method: SW846 8260B
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
142-28-9	1,3-Dichloropropane	ND	5.0	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
76-13-1	Freon 113	ND	5.0	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	ug/l	
591-78-6	2-Hexanone	ND	5.0	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/l	
74-95-3	Methylene bromide	ND	5.0	ug/l	
75-09-2	Methylene chloride	ND	2.0	ug/l	
91-20-3	Naphthalene	ND	5.0	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	ug/l	
100-42-5	Styrene	ND	5.0	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
109-99-9	Tetrahydrofuran	ND	10	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
110-57-6	Trans-1,4-Dichloro-2-Butene	ND	5.0	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
	m,p-Xylene	ND	1.0	ug/l	
95-47-6	o-Xylene	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	113%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263258		
Lab Sample ID:	MC13780-2	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
2037-26-5	Toluene-D8	100%		70-130%
460-00-4	4-Bromofluorobenzene	111%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263258
Lab Sample ID: MC13780-2
Matrix: AQ - Ground Water
Method: CT-ETPH 7/06 SW846 3510C
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BC645228.D	1	09/11/12	KN	09/08/12	OP30303	GBC3114
Run #2							

	Initial Volume	Final Volume
Run #1	970 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	Units	Q
	CT-ETPH (C9-C36)	ND	0.082	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	66%		50-149%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263258		
Lab Sample ID:	MC13780-2	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8082 SW846 3510C	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK16895.D	1	09/13/12	AP	09/08/12	OP30302	GBK633
Run #2							

	Initial Volume	Final Volume
Run #1	970 ml	5.0 ml
Run #2		

CT Polychlorinated Biphenyls RCP List

CAS No.	Compound	Result	RL	Units	Q
12674-11-2	Aroclor 1016	ND	0.26	ug/l	
11104-28-2	Aroclor 1221	ND	0.26	ug/l	
11141-16-5	Aroclor 1232	ND	0.26	ug/l	
53469-21-9	Aroclor 1242	ND	0.26	ug/l	
12672-29-6	Aroclor 1248	ND	0.26	ug/l	
11097-69-1	Aroclor 1254	ND	0.26	ug/l	
11096-82-5	Aroclor 1260	ND	0.26	ug/l	
37324-23-5	Aroclor 1262	ND	0.26	ug/l	
11100-14-4	Aroclor 1268	ND	0.26	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	72%		30-150%
877-09-8	Tetrachloro-m-xylene	43%		30-150%
2051-24-3	Decachlorobiphenyl	39%		30-150%
2051-24-3	Decachlorobiphenyl	23% [a]		30-150%

(a) Outside control limits due to possible matrix interference.

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263258UF
Lab Sample ID: MC13780-3
Matrix: AQ - Ground Water
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Arsenic	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Barium	< 50	50	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Cadmium	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Chromium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Copper	< 25	25	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Lead	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Mercury	< 0.20	0.20	ug/l	1	09/08/12	09/10/12	SA	SW846 7470A [1]	SW846 7470A [4]
Nickel	< 40	40	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Selenium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Silver	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Zinc	< 20	20	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]

(1) Instrument QC Batch: MA14692
(2) Instrument QC Batch: MA14700
(3) Prep QC Batch: MP19630
(4) Prep QC Batch: MP19634

RL = Reporting Limit

Report of Analysis

Client Sample ID: 1263255
Lab Sample ID: MC13780-4
Matrix: AQ - Ground Water
Method: SW846 8260B
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P64442.D	1	09/12/12	TT	n/a	n/a	MSP2103
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
67-64-1	Acetone	ND	5.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	ug/l	
71-43-2	Benzene	ND	0.50	ug/l	
108-86-1	Bromobenzene	ND	5.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	2.0	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	ug/l	
75-15-0	Carbon disulfide	ND	5.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	2.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	2.0	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	5.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	ug/l	

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263255		
Lab Sample ID:	MC13780-4	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
142-28-9	1,3-Dichloropropane	ND	5.0	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
76-13-1	Freon 113	ND	5.0	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	ug/l	
591-78-6	2-Hexanone	ND	5.0	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/l	
74-95-3	Methylene bromide	ND	5.0	ug/l	
75-09-2	Methylene chloride	ND	2.0	ug/l	
91-20-3	Naphthalene	ND	5.0	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	ug/l	
100-42-5	Styrene	ND	5.0	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
109-99-9	Tetrahydrofuran	ND	10	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
110-57-6	Trans-1,4-Dichloro-2-Butene	ND	5.0	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
	m,p-Xylene	ND	1.0	ug/l	
95-47-6	o-Xylene	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	112%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263255		
Lab Sample ID:	MC13780-4	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
2037-26-5	Toluene-D8	98%		70-130%
460-00-4	4-Bromofluorobenzene	111%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263255
Lab Sample ID: MC13780-4
Matrix: AQ - Ground Water
Method: CT-ETPH 7/06 SW846 3510C
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BC645232.D	1	09/11/12	KN	09/08/12	OP30303	GBC3114
Run #2							

	Initial Volume	Final Volume
Run #1	1000 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	Units	Q
	CT-ETPH (C9-C36)	0.0830	0.080	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	64%		50-149%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263255		
Lab Sample ID:	MC13780-4	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8082 SW846 3510C	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK16898.D	1	09/13/12	AP	09/08/12	OP30302	GBK633
Run #2							

	Initial Volume	Final Volume
Run #1	960 ml	5.0 ml
Run #2		

CT Polychlorinated Biphenyls RCP List

CAS No.	Compound	Result	RL	Units	Q
12674-11-2	Aroclor 1016	ND	0.26	ug/l	
11104-28-2	Aroclor 1221	ND	0.26	ug/l	
11141-16-5	Aroclor 1232	ND	0.26	ug/l	
53469-21-9	Aroclor 1242	ND	0.26	ug/l	
12672-29-6	Aroclor 1248	ND	0.26	ug/l	
11097-69-1	Aroclor 1254	ND	0.26	ug/l	
11096-82-5	Aroclor 1260	ND	0.26	ug/l	
37324-23-5	Aroclor 1262	ND	0.26	ug/l	
11100-14-4	Aroclor 1268	ND	0.26	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	76%		30-150%
877-09-8	Tetrachloro-m-xylene	43%		30-150%
2051-24-3	Decachlorobiphenyl	67%		30-150%
2051-24-3	Decachlorobiphenyl	41%		30-150%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263255UF
Lab Sample ID: MC13780-5
Matrix: AQ - Ground Water
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Arsenic	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Barium	88.8	50	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Cadmium	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Chromium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Copper	< 25	25	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Lead	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Mercury	< 0.20	0.20	ug/l	1	09/08/12	09/10/12	SA	SW846 7470A [1]	SW846 7470A [4]
Nickel	< 40	40	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Selenium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Silver	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Zinc	< 20	20	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]

(1) Instrument QC Batch: MA14692
(2) Instrument QC Batch: MA14700
(3) Prep QC Batch: MP19630
(4) Prep QC Batch: MP19634

RL = Reporting Limit

Report of Analysis

Client Sample ID: 1263256
Lab Sample ID: MC13780-6
Matrix: AQ - Ground Water
Method: SW846 8260B
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P64443.D	1	09/12/12	TT	n/a	n/a	MSP2103
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
67-64-1	Acetone	ND	5.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	ug/l	
71-43-2	Benzene	ND	0.50	ug/l	
108-86-1	Bromobenzene	ND	5.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	2.0	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	ug/l	
75-15-0	Carbon disulfide	ND	5.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	2.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	2.0	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	5.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	ug/l	

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263256		
Lab Sample ID:	MC13780-6	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
142-28-9	1,3-Dichloropropane	ND	5.0	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
76-13-1	Freon 113	ND	5.0	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	ug/l	
591-78-6	2-Hexanone	ND	5.0	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/l	
74-95-3	Methylene bromide	ND	5.0	ug/l	
75-09-2	Methylene chloride	ND	2.0	ug/l	
91-20-3	Naphthalene	ND	5.0	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	ug/l	
100-42-5	Styrene	ND	5.0	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
109-99-9	Tetrahydrofuran	ND	10	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
110-57-6	Trans-1,4-Dichloro-2-Butene	ND	5.0	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/l	
71-55-6	1,1,1-Trichloroethane	4.8	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
	m,p-Xylene	ND	1.0	ug/l	
95-47-6	o-Xylene	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	112%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263256		
Lab Sample ID:	MC13780-6	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
2037-26-5	Toluene-D8	100%		70-130%
460-00-4	4-Bromofluorobenzene	110%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263256
Lab Sample ID: MC13780-6
Matrix: AQ - Ground Water
Method: CT-ETPH 7/06 SW846 3510C
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BC645200.D	1	09/10/12	KN	09/08/12	OP30303	GBC3114
Run #2							

	Initial Volume	Final Volume
Run #1	850 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	Units	Q
	CT-ETPH (C9-C36)	0.0979	0.094	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	64%		50-149%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263256		
Lab Sample ID:	MC13780-6	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8082 SW846 3510C	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK16899.D	1	09/13/12	AP	09/08/12	OP30302	GBK633
Run #2							

	Initial Volume	Final Volume
Run #1	950 ml	5.0 ml
Run #2		

CT Polychlorinated Biphenyls RCP List

CAS No.	Compound	Result	RL	Units	Q
12674-11-2	Aroclor 1016	ND	0.26	ug/l	
11104-28-2	Aroclor 1221	ND	0.26	ug/l	
11141-16-5	Aroclor 1232	ND	0.26	ug/l	
53469-21-9	Aroclor 1242	ND	0.26	ug/l	
12672-29-6	Aroclor 1248	ND	0.26	ug/l	
11097-69-1	Aroclor 1254	ND	0.26	ug/l	
11096-82-5	Aroclor 1260	ND	0.26	ug/l	
37324-23-5	Aroclor 1262	ND	0.26	ug/l	
11100-14-4	Aroclor 1268	ND	0.26	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	65%		30-150%
877-09-8	Tetrachloro-m-xylene	36%		30-150%
2051-24-3	Decachlorobiphenyl	64%		30-150%
2051-24-3	Decachlorobiphenyl	39%		30-150%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263256UF
Lab Sample ID: MC13780-7
Matrix: AQ - Ground Water
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Arsenic	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Barium	69.9	50	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Cadmium	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Chromium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Copper	< 25	25	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Lead	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Mercury	< 0.20	0.20	ug/l	1	09/08/12	09/10/12	SA	SW846 7470A [1]	SW846 7470A [4]
Nickel	< 40	40	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Selenium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Silver	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Zinc	< 20	20	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]

(1) Instrument QC Batch: MA14692
(2) Instrument QC Batch: MA14700
(3) Prep QC Batch: MP19630
(4) Prep QC Batch: MP19634

RL = Reporting Limit

Report of Analysis

Client Sample ID:	1263257		
Lab Sample ID:	MC13780-8	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P64444.D	1	09/12/12	TT	n/a	n/a	MSP2103
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
67-64-1	Acetone	ND	5.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	ug/l	
71-43-2	Benzene	ND	0.50	ug/l	
108-86-1	Bromobenzene	ND	5.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	2.0	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	ug/l	
75-15-0	Carbon disulfide	ND	5.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	2.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	2.0	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	5.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	ug/l	

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263257
Lab Sample ID: MC13780-8
Matrix: AQ - Ground Water
Method: SW846 8260B
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

VOA RCP List

CAS No.	Compound	Result	RL	Units	Q
142-28-9	1,3-Dichloropropane	ND	5.0	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
76-13-1	Freon 113	ND	5.0	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	ug/l	
591-78-6	2-Hexanone	ND	5.0	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/l	
74-95-3	Methylene bromide	ND	5.0	ug/l	
75-09-2	Methylene chloride	ND	2.0	ug/l	
91-20-3	Naphthalene	ND	5.0	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	ug/l	
100-42-5	Styrene	ND	5.0	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
109-99-9	Tetrahydrofuran	ND	10	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
110-57-6	Trans-1,4-Dichloro-2-Butene	ND	5.0	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/l	
71-55-6	1,1,1-Trichloroethane	4.9	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
	m,p-Xylene	ND	1.0	ug/l	
95-47-6	o-Xylene	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	116%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263257		
Lab Sample ID:	MC13780-8	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

VOA RCP List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
2037-26-5	Toluene-D8	103%		70-130%
460-00-4	4-Bromofluorobenzene	114%		70-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263257
Lab Sample ID: MC13780-8
Matrix: AQ - Ground Water
Method: CT-ETPH 7/06 SW846 3510C
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BC645202.D	1	09/10/12	KN	09/08/12	OP30303	GBC3114
Run #2							

	Initial Volume	Final Volume
Run #1	890 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	Units	Q
	CT-ETPH (C9-C36)	ND	0.090	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	56%		50-149%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	1263257		
Lab Sample ID:	MC13780-8	**Date Sampled:**	09/06/12
Matrix:	AQ - Ground Water	**Date Received:**	09/06/12
Method:	SW846 8082 SW846 3510C	**Percent Solids:**	n/a
Project:	PWCTEH:F & H Buildings Groundwater		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BK16900.D	1	09/13/12	AP	09/08/12	OP30302	GBK633
Run #2							

	Initial Volume	Final Volume
Run #1	970 ml	5.0 ml
Run #2		

CT Polychlorinated Biphenyls RCP List

CAS No.	Compound	Result	RL	Units	Q
12674-11-2	Aroclor 1016	ND	0.26	ug/l	
11104-28-2	Aroclor 1221	ND	0.26	ug/l	
11141-16-5	Aroclor 1232	ND	0.26	ug/l	
53469-21-9	Aroclor 1242	ND	0.26	ug/l	
12672-29-6	Aroclor 1248	ND	0.26	ug/l	
11097-69-1	Aroclor 1254	ND	0.26	ug/l	
11096-82-5	Aroclor 1260	ND	0.26	ug/l	
37324-23-5	Aroclor 1262	ND	0.26	ug/l	
11100-14-4	Aroclor 1268	ND	0.26	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	78%		30-150%
877-09-8	Tetrachloro-m-xylene	46%		30-150%
2051-24-3	Decachlorobiphenyl	68%		30-150%
2051-24-3	Decachlorobiphenyl	43%		30-150%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: 1263257UF
Lab Sample ID: MC13780-9
Matrix: AQ - Ground Water
Project: PWCTEH:F & H Buildings Groundwater

Date Sampled: 09/06/12
Date Received: 09/06/12
Percent Solids: n/a

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Arsenic	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Barium	69.5	50	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Cadmium	< 4.0	4.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Chromium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Copper	< 25	25	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Lead	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Mercury	< 0.20	0.20	ug/l	1	09/10/12	09/11/12	EM	SW846 7470A [1]	SW846 7470A [4]
Nickel	< 40	40	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Selenium	< 10	10	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Silver	< 5.0	5.0	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]
Zinc	< 20	20	ug/l	1	09/07/12	09/10/12	EAL	SW846 6010C [2]	SW846 3010A [3]

(1) Instrument QC Batch: MA14696
(2) Instrument QC Batch: MA14700
(3) Prep QC Batch: MP19630
(4) Prep QC Batch: MP19637

RL = Reporting Limit

New England ACCUTEST LABORATORIES

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- RCP Form
- Sample Tracking Chronicle

ACCUTEST LABORATORIES

CHAIN OF CUSTODY

Accutest Laboratories of New England
495 Technology Center West, Building One
TEL. 508-481-6200 FAX: 508-481-7753
www.accutest.com

PAGE 1 OF 1

FED-EX Tracking #: | Bottle Order Control #:
Accutest Quote #: FD1/2012-218 | Accutest Job #: MC13780

Client / Reporting Information

Company Name: Loureiro Engineering Assoc
Street Address: 100 Northwest Drive
City / State / Zip: Plainville CT 06062
Project Contact / E-mail: Robin McKinney
Phone # / Fax #: 860-747-6181
Sampler(s) Name(s) / Phone #: J. Marcantonio

Project Information

Project Name: UTC PWEH F&H Buildings GW
Street: Willow St.
City: East Hartford, CT
Project #: 88UT136
Client PO#:
Project Manager: Dave Fierick

Billing Information (If different from Report to)

Company Name:
Street Address:
City / State / Zip:
Attention: PO#:

Requested Analysis (see TEST CODE sheet)

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL- Sludge; SED-Sediment; OI - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB-Field Blank; EB- Equipment Blank; RB- Rinse Blank; TB-Trip Blank

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	Bisulfate	VOC, 8260B	CT ETPH	PCB's 8082	TOTAL RCRA8 + Cu, Ni, Zn	HOLD	LAB USE ONLY
-1	12Ge3259		9/6/12	0910	JM	TB	1	1									X					
-2	12Ge3258		9/6/12	1240	JM	GW	6	2				4					X	X	X			
-3	12Ge3258UF		9/6/12	1240	JM	GW	1			1										X		
-4	12Ge3255		9/6/12	1107	JM	GW	6	2				4					X	X	X			
-5	12Ge3255UF		9/6/12	1107	JM	GW	1			1										X		
-6	12Ge3256		9/6/12	1217	JM	GW	6	2				4					X	X	X			
-7	12Ge3256UF		9/6/12	1217	JM	GW	1			1										X		
-8	12Ge3257		9/6/12	1217	JM	GW	6	2				4					X	X	X			17B, 5D,
-9	12Ge3257UF		9/6/12	1217	JM	GW	1			1										X		2H1

Turnaround Time (Business days) — Approved By (Accutest PM): / Date:

- [ ] Std. 10 Business Days
- [x] Std. 5 Business Days (By Contract only)
- [ ] 5 Day *RUSH*
- [ ] 3 Day *EMERGENCY*
- [ ] 2 Day *EMERGENCY*
- [ ] 1 Day *EMERGENCY*

Emergency & Rush T/A data available VIA Lablink

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [x] CT RCP
- [ ] MA MCP
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary

Comments / Special Instructions

Provide CT RCP Report

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1	9/6/2012 1615	1	2	9-6-12 1810	2 B.C
3	Date Time:	3	4	Date Time:	4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal #	Intact / Not Intact	Preserved where applicable / On Ice / Cooler Temp. 2.1°C

MC13780: Chain of Custody
Page 1 of 2

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: MC13780 **Client:** LEA **Immediate Client Services Action Required:** No

Date / Time Received: 9/6/2012 **Delivery Method:** **Client Service Action Required at Login:** No

Project: BUILDINGS GW **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	Infared gun		
3. Cooler media:	Ice (bag)		

Quality Control Preservatio	Y	or	N	N/A
1. Trip Blank present / cooler:	☑		☐	☐
2. Trip Blank listed on COC:	☑		☐	☐
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☑		☐	☐

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

Accutest Laboratories
V:508.481.6200

495 Technology Center West, Bldg One
F: 508.481.7753

Marlborough, MA
www/accutest.com

MC13780: Chain of Custody
Page 2 of 2

Reasonable Confidence Protocol
Laboratory Analysis
QA/QC Certification Form

Laboratory Name: **Accutest New England** **Client:** **Loureiro Eng. Associates**

Project Location: **PWCTEH:F & H Buildings Groundwater** **Project Number:** **88UT136**

Sampling Date(s): **9/6/2012**

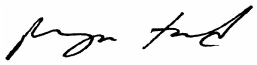
Laboratory Sample ID(s): MC13780-1, MC13780-2, MC13780-3, MC13780-4, MC13780-5, MC13780-6, MC13780-7, MC13780-8, MC13780-9

Methods: CT-ETPH 7/06, SW846 6010C, SW846 7470A, SW846 8082, SW846 8260B

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the CTDEP method-specific Reasonable Confidence Protocol documents)?	Yes ☑ No ☐
1A	Where all the method specified preservation and holding time requirements met?	Yes ☑ No ☐
1B	VPH and EPH mehods only: Was the VPH or EPH method conducted without significant modifications (See section 11.3 of respective methods)	Yes ☐ No ☐ NA ☑
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	Yes ☑ No ☐
3	Were samples received at an appropriate temperature (<6° C)?	Yes ☑ No ☐
4	Were all QA/QC performance criteria specified in the CTDEP Reasonable Confidence Protocol documents achieved?	Yes ☐ No ☑
5	a) Were reporting limits specified or referenced on the chain-of-custody?	Yes ☐ No ☑
	b) Were these reporting limits met?	Yes ☐ No ☑
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the Reasonable Confidence Protocol documents?	Yes ☐ No ☑
7	Are project-specific matrix spikes and laboratory duplicates included in this data set?	Yes ☑ No ☐

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1A or #1B is "No", the data package does not meet the requirements for "Reasonable Confidence".

I, the undersigned, attest under pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete.

Authorized Signature:  Position: Lab Director

Printed Name: Reza Tand, Accutest New England Date: 9/13/2012

Internal Sample Tracking Chronicle

Loureiro Eng. Associates

Job No: MC13780

PWCTEH:F & H Buildings Groundwater
Project No: 88UT136

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC13780-1	Collected: 06-SEP-12 09:10 By: JM		Received: 06-SEP-12 By:			
1263259						
MC13780-1	SW846 8260B	11-SEP-12 23:59	TT			V8260RCP
MC13780-2	Collected: 06-SEP-12 12:40 By: JM		Received: 06-SEP-12 By:			
1263258						
MC13780-2	CT-ETPH 7/06	11-SEP-12 03:35	KN	08-SEP-12	MEW	BCTTPH
MC13780-2	SW846 8260B	12-SEP-12 06:01	TT			V8260RCP
MC13780-2	SW846 8082	13-SEP-12 12:50	AP	08-SEP-12	PA	P8082RCP
MC13780-3	Collected: 06-SEP-12 12:40 By: JM		Received: 06-SEP-12 By:			
1263258UF						
MC13780-3	SW846 7470A	10-SEP-12 11:33	SA	08-SEP-12	EM	HG
MC13780-3	SW846 6010C	10-SEP-12 15:01	EAL	07-SEP-12	DA	AG,AS,BA,CD,CR,CU,NI,PB,SE,ZN
MC13780-4	Collected: 06-SEP-12 11:07 By: JM		Received: 06-SEP-12 By:			
1263255						
MC13780-4	CT-ETPH 7/06	11-SEP-12 04:39	KN	08-SEP-12	MEW	BCTTPH
MC13780-4	SW846 8260B	12-SEP-12 06:29	TT			V8260RCP
MC13780-4	SW846 8082	13-SEP-12 13:46	AP	08-SEP-12	PA	P8082RCP
MC13780-5	Collected: 06-SEP-12 11:07 By: JM		Received: 06-SEP-12 By:			
1263255UF						
MC13780-5	SW846 7470A	10-SEP-12 11:35	SA	08-SEP-12	EM	HG
MC13780-5	SW846 6010C	10-SEP-12 15:06	EAL	07-SEP-12	DA	AG,AS,BA,CD,CR,CU,NI,PB,SE,ZN
MC13780-6	Collected: 06-SEP-12 12:17 By: JM		Received: 06-SEP-12 By:			
1263256						
MC13780-6	CT-ETPH 7/06	10-SEP-12 20:09	KN	08-SEP-12	MEW	BCTTPH
MC13780-6	SW846 8260B	12-SEP-12 06:56	TT			V8260RCP
MC13780-6	SW846 8082	13-SEP-12 14:05	AP	08-SEP-12	PA	P8082RCP

Internal Sample Tracking Chronicle

Loureiro Eng. Associates

Job No: MC13780

PWCTEH:F & H Buildings Groundwater
Project No: 88UT136

Sample Number	Method	Analyzed	By	Prepped	By	Test Codes
MC13780-7 Collected: 06-SEP-12 12:17 By: JM 1263256UF			Received: 06-SEP-12 By:			
MC13780-7	SW846 7470A	10-SEP-12 11:38	SA	08-SEP-12	EM	HG
MC13780-7	SW846 6010C	10-SEP-12 15:33	EAL	07-SEP-12	DA	AG,AS,BA,CD,CR,CU,NI,PB,SE,ZN
MC13780-8 Collected: 06-SEP-12 12:17 By: JM 1263257			Received: 06-SEP-12 By:			
MC13780-8	CT-ETPH 7/06	10-SEP-12 20:41	KN	08-SEP-12	MEW	BCTTPH
MC13780-8	SW846 8260B	12-SEP-12 07:24	TT			V8260RCP
MC13780-8	SW846 8082	13-SEP-12 14:24	AP	08-SEP-12	PA	P8082RCP
MC13780-9 Collected: 06-SEP-12 12:17 By: JM 1263257UF			Received: 06-SEP-12 By:			
MC13780-9	SW846 6010C	10-SEP-12 15:38	EAL	07-SEP-12	DA	AG,AS,BA,CD,CR,CU,NI,PB,SE,ZN
MC13780-9	SW846 7470A	11-SEP-12 11:39	EM	10-SEP-12	EM	HG

New England ACCUTEST LABORATORIES

GC/MS Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Internal Standard Area Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSP2103-MB	P64427.D	1	09/11/12	TT	n/a	n/a	MSP2103

The QC reported here applies to the following samples: **Method:** SW846 8260B

MC13780-1, MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Result	RL	Units	Q
67-64-1	Acetone	ND	5.0	ug/l	
107-13-1	Acrylonitrile	ND	5.0	ug/l	
71-43-2	Benzene	ND	0.50	ug/l	
108-86-1	Bromobenzene	ND	5.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	2.0	ug/l	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/l	
104-51-8	n-Butylbenzene	ND	5.0	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	ug/l	
75-15-0	Carbon disulfide	ND	5.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	2.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	2.0	ug/l	
95-49-8	o-Chlorotoluene	ND	5.0	ug/l	
106-43-4	p-Chlorotoluene	ND	5.0	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	5.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	ug/l	
142-28-9	1,3-Dichloropropane	ND	5.0	ug/l	
594-20-7	2,2-Dichloropropane	ND	5.0	ug/l	
563-58-6	1,1-Dichloropropene	ND	5.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ug/l	

Method Blank Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSP2103-MB	P64427.D	1	09/11/12	TT	n/a	n/a	MSP2103

The QC reported here applies to the following samples: **Method:** SW846 8260B

MC13780-1, MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Result	RL	Units	Q
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
76-13-1	Freon 113	ND	5.0	ug/l	
87-68-3	Hexachlorobutadiene	ND	5.0	ug/l	
591-78-6	2-Hexanone	ND	5.0	ug/l	
98-82-8	Isopropylbenzene	ND	5.0	ug/l	
99-87-6	p-Isopropyltoluene	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/l	
74-95-3	Methylene bromide	ND	5.0	ug/l	
75-09-2	Methylene chloride	ND	2.0	ug/l	
91-20-3	Naphthalene	ND	5.0	ug/l	
103-65-1	n-Propylbenzene	ND	5.0	ug/l	
100-42-5	Styrene	ND	5.0	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	5.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
109-99-9	Tetrahydrofuran	ND	10	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
110-57-6	Trans-1,4-Dichloro-2-Butene	ND	5.0	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	5.0	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	5.0	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	5.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
	m,p-Xylene	ND	1.0	ug/l	
95-47-6	o-Xylene	ND	1.0	ug/l	

Method Blank Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSP2103-MB	P64427.D	1	09/11/12	TT	n/a	n/a	MSP2103

The QC reported here applies to the following samples: **Method:** SW846 8260B

MC13780-1, MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Surrogate Recoveries		Limits
1868-53-7	Dibromofluoromethane	112%	70-130%
2037-26-5	Toluene-D8	101%	70-130%
460-00-4	4-Bromofluorobenzene	115%	70-130%

Blank Spike Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSP2103-BS	P64424.D	1	09/11/12	TT	n/a	n/a	MSP2103

The QC reported here applies to the following samples: **Method:** SW846 8260B

MC13780-1, MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
67-64-1	Acetone	50	61.7	123	70-130
107-13-1	Acrylonitrile	50	49.6	99	70-130
71-43-2	Benzene	50	44.7	89	70-130
108-86-1	Bromobenzene	50	42.7	85	70-130
75-27-4	Bromodichloromethane	50	55.7	111	70-130
75-25-2	Bromoform	50	44.1	88	70-130
74-83-9	Bromomethane	50	49.4	99	70-130
78-93-3	2-Butanone (MEK)	50	42.4	85	70-130
104-51-8	n-Butylbenzene	50	43.5	87	70-130
135-98-8	sec-Butylbenzene	50	44.4	89	70-130
98-06-6	tert-Butylbenzene	50	49.2	98	70-130
75-15-0	Carbon disulfide	50	42.4	85	70-130
56-23-5	Carbon tetrachloride	50	58.8	118	70-130
108-90-7	Chlorobenzene	50	40.7	81	70-130
75-00-3	Chloroethane	50	50.7	101	70-130
67-66-3	Chloroform	50	57.3	115	70-130
74-87-3	Chloromethane	50	43.3	87	70-130
95-49-8	o-Chlorotoluene	50	45.9	92	70-130
106-43-4	p-Chlorotoluene	50	46.0	92	70-130
96-12-8	1,2-Dibromo-3-chloropropane	50	45.8	92	70-130
124-48-1	Dibromochloromethane	50	48.1	96	70-130
106-93-4	1,2-Dibromoethane	50	43.0	86	70-130
95-50-1	1,2-Dichlorobenzene	50	42.0	84	70-130
541-73-1	1,3-Dichlorobenzene	50	41.9	84	70-130
106-46-7	1,4-Dichlorobenzene	50	42.6	85	70-130
75-71-8	Dichlorodifluoromethane	50	42.9	86	70-130
75-34-3	1,1-Dichloroethane	50	51.7	103	70-130
107-06-2	1,2-Dichloroethane	50	59.5	119	70-130
75-35-4	1,1-Dichloroethene	50	44.8	90	70-130
156-59-2	cis-1,2-Dichloroethene	50	47.3	95	70-130
156-60-5	trans-1,2-Dichloroethene	50	42.9	86	70-130
78-87-5	1,2-Dichloropropane	50	48.4	97	70-130
142-28-9	1,3-Dichloropropane	50	45.6	91	70-130
594-20-7	2,2-Dichloropropane	50	26.6	53* [a]	70-130
563-58-6	1,1-Dichloropropene	50	50.9	102	70-130
10061-01-5	cis-1,3-Dichloropropene	50	40.5	81	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSP2103-BS	P64424.D	1	09/11/12	TT	n/a	n/a	MSP2103

The QC reported here applies to the following samples: **Method:** SW846 8260B

MC13780-1, MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
10061-02-6	trans-1,3-Dichloropropene	50	39.2	78	70-130
100-41-4	Ethylbenzene	50	43.4	87	70-130
76-13-1	Freon 113	50	50.8	102	70-130
87-68-3	Hexachlorobutadiene	50	41.5	83	70-130
591-78-6	2-Hexanone	50	41.6	83	70-130
98-82-8	Isopropylbenzene	50	45.6	91	70-130
99-87-6	p-Isopropyltoluene	50	44.1	88	70-130
1634-04-4	Methyl Tert Butyl Ether	50	44.1	88	70-130
108-10-1	4-Methyl-2-pentanone (MIBK)	50	51.9	104	70-130
74-95-3	Methylene bromide	50	51.5	103	70-130
75-09-2	Methylene chloride	50	44.2	88	70-130
91-20-3	Naphthalene	50	25.2	50* [a]	70-130
103-65-1	n-Propylbenzene	50	45.0	90	70-130
100-42-5	Styrene	50	41.8	84	70-130
630-20-6	1,1,1,2-Tetrachloroethane	50	50.7	101	70-130
79-34-5	1,1,2,2-Tetrachloroethane	50	48.8	98	70-130
127-18-4	Tetrachloroethene	50	40.8	82	70-130
109-99-9	Tetrahydrofuran	50	52.3	105	70-130
108-88-3	Toluene	50	47.6	95	70-130
110-57-6	Trans-1,4-Dichloro-2-Butene	50	25.0	50* [a]	70-130
87-61-6	1,2,3-Trichlorobenzene	50	34.9	70	70-130
120-82-1	1,2,4-Trichlorobenzene	50	34.5	69* [a]	70-130
71-55-6	1,1,1-Trichloroethane	50	56.6	113	70-130
79-00-5	1,1,2-Trichloroethane	50	51.8	104	70-130
79-01-6	Trichloroethene	50	52.0	104	70-130
75-69-4	Trichlorofluoromethane	50	59.5	119	70-130
96-18-4	1,2,3-Trichloropropane	50	42.7	85	70-130
95-63-6	1,2,4-Trimethylbenzene	50	45.5	91	70-130
108-67-8	1,3,5-Trimethylbenzene	50	45.4	91	70-130
75-01-4	Vinyl chloride	50	50.3	101	70-130
	m,p-Xylene	100	84.6	85	70-130
95-47-6	o-Xylene	50	43.1	86	70-130

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MSP2103-BS	P64424.D	1	09/11/12	TT	n/a	n/a	MSP2103

The QC reported here applies to the following samples: **Method:** SW846 8260B

MC13780-1, MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	116%	70-130%
2037-26-5	Toluene-D8	108%	70-130%
460-00-4	4-Bromofluorobenzene	110%	70-130%

(a) Outside control limits. Blank Spike meets program technical requirements.

* = Outside of Control Limits.

Volatile Internal Standard Area Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Check Std:	MSP2103-CC2072	**Injection Date:**	09/11/12
Lab File ID:	P64424.D	**Injection Time:**	22:08
Instrument ID:	GCMSP	**Method:**	SW846 8260B

	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
Check Std	349329	8.25	568993	9.09	341359	12.31	282337	14.87	107509	5.95
Upper Limit [a]	698658	8.75	1137986	9.59	682718	12.81	564674	15.37	215018	6.45
Lower Limit [b]	174665	7.75	284497	8.59	170680	11.81	141169	14.37	53755	5.45

Lab Sample ID	IS 1 AREA	RT	IS 2 AREA	RT	IS 3 AREA	RT	IS 4 AREA	RT	IS 5 AREA	RT
MSP2103-BS	349329	8.25	568993	9.09	341359	12.31	282337	14.87	107509	5.95
MSP2103-MB	338852	8.26	555683	9.10	311366	12.31	215916	14.87	100186	5.97
MC13780-1	320907	8.25	524333	9.10	296726	12.31	206789	14.87	95556	5.96
ZZZZZZ	324009	8.25	527600	9.10	298425	12.31	206067	14.87	98046	5.96
ZZZZZZ	328853	8.26	534699	9.10	303181	12.32	212350	14.87	96451	5.97
ZZZZZZ	316151	8.26	517543	9.10	295428	12.31	200569	14.87	89722	5.97
MC13795-1	311743	8.25	519581	9.10	297981	12.31	199167	14.87	93716	5.97
ZZZZZZ	300839	8.26	490016	9.10	275674	12.32	187344	14.87	83257	5.97
ZZZZZZ	301996	8.26	500193	9.10	285203	12.31	196213	14.87	85014	5.97
ZZZZZZ	340354	8.25	553494	9.10	322916	12.31	252469	14.87	105212	5.97
ZZZZZZ	326275	8.25	538756	9.10	305602	12.31	212018	14.87	98533	5.96
ZZZZZZ	318287	8.26	524196	9.10	297108	12.32	203267	14.87	88347	5.97
ZZZZZZ	311465	8.25	513813	9.10	291303	12.31	198355	14.87	95273	5.96
ZZZZZZ	304255	8.25	501455	9.10	287473	12.32	197767	14.87	88083	5.98
ZZZZZZ	305659	8.25	502799	9.10	292112	12.31	195474	14.87	81308	5.97
MC13780-2	295010	8.26	484726	9.10	278137	12.32	189931	14.87	73361	5.98
MC13780-4	295507	8.26	487260	9.10	283183	12.32	188637	14.87	74577	5.98
MC13780-6	287253	8.26	472812	9.10	275299	12.32	186944	14.87	79582	5.97
MC13780-8	277963	8.25	461677	9.10	265361	12.31	180579	14.87	76331	5.96
ZZZZZZ	357036	8.24	614931	9.09	405979	12.31	409195	14.87	120780	5.93
MC13795-1MS	464603	8.25	754293	9.09	434208	12.31	356102	14.87	146349	5.95
MC13795-1MSD	461441	8.25	743873	9.10	423326	12.31	344764	14.87	147087	5.94

IS 1 = Pentafluorobenzene
IS 2 = 1,4-Difluorobenzene
IS 3 = Chlorobenzene-D5
IS 4 = 1,4-Dichlorobenzene-d4
IS 5 = Tert Butyl Alcohol-D9

(a) Upper Limit = + 100% of check standard area; Retention time + 0.5 minutes.
(b) Lower Limit = -50% of check standard area; Retention time -0.5 minutes.

Volatile Surrogate Recovery Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Method: SW846 8260B **Matrix:** AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1	S2	S3
MC13780-1	P64428.D	115.0	104.0	115.0
MC13780-2	P64441.D	113.0	100.0	111.0
MC13780-4	P64442.D	112.0	98.0	111.0
MC13780-6	P64443.D	112.0	100.0	110.0
MC13780-8	P64444.D	116.0	103.0	114.0
MSP2103-BS	P64424.D	116.0	108.0	110.0
MSP2103-MB	P64427.D	112.0	101.0	115.0

Surrogate Compounds	Recovery Limits
S1 = Dibromofluoromethane	70-130%
S2 = Toluene-D8	70-130%
S3 = 4-Bromofluorobenzene	70-130%

New England ACCUTEST LABORATORIES

GC Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries
- Surrogate Recovery Summaries

Method Blank Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP30303-MB	BC645188.D	1	09/10/12	KN	09/08/12	OP30303	GBC3114

The QC reported here applies to the following samples: **Method:** CT-ETPH 7/06

MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Result	RL	Units	Q
	CT-ETPH (C9-C36)	ND	0.080	mg/l	

CAS No.	Surrogate Recoveries		Limits
84-15-1	o-Terphenyl	96%	50-149%

Method Blank Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP30302-MB	BK16886.D	1	09/13/12	AP	09/08/12	OP30302	GBK633

The QC reported here applies to the following samples: **Method:** SW846 8082

MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Result	RL	Units	Q
12674-11-2	Aroclor 1016	ND	0.25	ug/l	
11104-28-2	Aroclor 1221	ND	0.25	ug/l	
11141-16-5	Aroclor 1232	ND	0.25	ug/l	
53469-21-9	Aroclor 1242	ND	0.25	ug/l	
12672-29-6	Aroclor 1248	ND	0.25	ug/l	
11097-69-1	Aroclor 1254	ND	0.25	ug/l	
11096-82-5	Aroclor 1260	ND	0.25	ug/l	
37324-23-5	Aroclor 1262	ND	0.25	ug/l	
11100-14-4	Aroclor 1268	ND	0.25	ug/l	

CAS No.	Surrogate Recoveries		Limits
877-09-8	Tetrachloro-m-xylene	103%	30-150%
877-09-8	Tetrachloro-m-xylene	85%	30-150%
2051-24-3	Decachlorobiphenyl	116%	30-150%
2051-24-3	Decachlorobiphenyl	89%	30-150%

Blank Spike Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP30303-BS	BC645190.D	1	09/10/12	KN	09/08/12	OP30303	GBC3114

The QC reported here applies to the following samples: **Method:** CT-ETPH 7/06

MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Spike mg/l	BSP mg/l	BSP %	Limits
	CT-ETPH (C9-C36)	0.7	0.470	67	60-120

CAS No.	Surrogate Recoveries	BSP	Limits
84-15-1	o-Terphenyl	87%	50-149%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP30302-BS	BK16887.D	1	09/13/12	AP	09/08/12	OP30302	GBK633

The QC reported here applies to the following samples: **Method:** SW846 8082

MC13780-2, MC13780-4, MC13780-6, MC13780-8

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
12674-11-2	Aroclor 1016	2	1.7	85	40-140
11104-28-2	Aroclor 1221		ND		40-140
11141-16-5	Aroclor 1232		ND		40-140
53469-21-9	Aroclor 1242		ND		40-140
12672-29-6	Aroclor 1248		ND		40-140
11097-69-1	Aroclor 1254		ND		40-140
11096-82-5	Aroclor 1260	2	1.6	80	40-140
37324-23-5	Aroclor 1262		ND		40-140
11100-14-4	Aroclor 1268		ND		40-140

CAS No.	Surrogate Recoveries	BSP	Limits
877-09-8	Tetrachloro-m-xylene	92%	30-150%
877-09-8	Tetrachloro-m-xylene	77%	30-150%
2051-24-3	Decachlorobiphenyl	111%	30-150%
2051-24-3	Decachlorobiphenyl	85%	30-150%

* = Outside of Control Limits.

Semivolatile Surrogate Recovery Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Method: CT-ETPH 7/06 **Matrix:** AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]
MC13780-2	BC645228.D	66.0
MC13780-4	BC645232.D	64.0
MC13780-6	BC645200.D	64.0
MC13780-8	BC645202.D	56.0
OP30303-BS	BC645190.D	87.0
OP30303-MB	BC645188.D	96.0

Surrogate Compounds	Recovery Limits
S1 = o-Terphenyl	50-149%

(a) Recovery from GC signal #1

Semivolatile Surrogate Recovery Summary

Job Number: MC13780
Account: LEA Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

Method: SW846 8082 **Matrix:** AQ

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 [a]	S1 [b]	S2 [a]	S2 [b]
MC13780-2	BK16895.D	72.0	43.0	39.0	23.0* [c]
MC13780-4	BK16898.D	76.0	43.0	67.0	41.0
MC13780-6	BK16899.D	65.0	36.0	64.0	39.0
MC13780-8	BK16900.D	78.0	46.0	68.0	43.0
OP30302-BS	BK16887.D	92.0	77.0	111.0	85.0
OP30302-MB	BK16886.D	103.0	85.0	116.0	89.0

Surrogate Compounds	Recovery Limits
S1 = Tetrachloro-m-xylene	30-150%
S2 = Decachlorobiphenyl	30-150%

(a) Recovery from GC signal #1
(b) Recovery from GC signal #2
(c) Outside control limits due to possible matrix interference.

New England ACCUTEST LABORATORIES

Metals Analysis

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19630
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 09/07/12

Metal	RL	IDL	MDL	MB raw	final
Aluminum	200	13	21		
Antimony	6.0	.8	1.7		
Arsenic	4.0	.99	1.9	-0.20	<4.0
Barium	50	.28	.65	0.10	<50
Beryllium	4.0	.13	.28		
Boron	100	.58	.59		
Cadmium	4.0	.19	.19	0.0	<4.0
Calcium	5000	34	36		
Chromium	10	.6	.83	0.10	<10
Cobalt	50	.15	.4		
Copper	25	.85	1.4	0.0	<25
Gold	50	1.8	2.7		
Iron	100	4.2	11		
Lead	5.0	1.3	2.1	-0.20	<5.0
Magnesium	5000	36	60		
Manganese	15	.05	.54		
Molybdenum	100	.23	1.5		
Nickel	40	.25	.7	0.10	<40
Palladium	50	2.4	7.9		
Platinum	50	6.6	19		
Potassium	5000	45	190		
Selenium	10	1.4	2	-0.20	<10
Silicon	100	4.8	8.4		
Silver	5.0	.69	1.3	-0.30	<5.0
Sodium	5000	13	40		
Strontium	10	.11	.35		
Thallium	5.0	.99	1.4		
Tin	100	.34	.75		
Titanium	50	.55	.88		
Tungsten	100	5.9	14		
Vanadium	10	.95	1.3		
Zinc	20	.33	4	1.3	<20

Associated samples MP19630: MC13780-3, MC13780-5, MC13780-7, MC13780-9

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19630 Methods: SW846 6010C
Matrix Type: AQUEOUS Units: ug/l

Prep Date:

Metal

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19630
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date:		09/07/12				09/07/12			
Metal	BSP Result	Spikelot MPICP	% Rec	QC Limits	BSD Result	Spikelot MPICP	% Rec	BSD RPD	QC Limit
Aluminum									
Antimony									
Arsenic	503	500	100.6	80-120	498	500	99.6	1.0	20
Barium	1920	2000	96.0	80-120	1950	2000	97.5	1.6	20
Beryllium									
Boron									
Cadmium	492	500	98.4	80-120	493	500	98.6	0.2	20
Calcium									
Chromium	504	500	100.8	80-120	509	500	101.8	1.0	20
Cobalt									
Copper	470	500	94.0	80-120	474	500	94.8	0.8	20
Gold									
Iron									
Lead	988	1000	98.8	80-120	985	1000	98.5	0.3	20
Magnesium									
Manganese									
Molybdenum									
Nickel	495	500	99.0	80-120	493	500	98.6	0.4	20
Palladium									
Platinum									
Potassium									
Selenium	485	500	97.0	80-120	487	500	97.4	0.4	20
Silicon									
Silver	200	200	100.0	80-120	202	200	101.0	1.0	20
Sodium									
Strontium									
Thallium									
Tin									
Titanium									
Tungsten									
Vanadium									
Zinc	502	500	100.4	80-120	501	500	100.2	0.2	20

Associated samples MP19630: MC13780-3, MC13780-5, MC13780-7, MC13780-9

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19630
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date:

Metal

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SERIAL DILUTION RESULTS SUMMARY

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19630
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 09/07/12

Metal	MC13777-15 Original	SDL 1:5	%DIF	QC Limits
Aluminum				
Antimony				
Arsenic	0.00	0.00	NC	0-10
Barium	312	305	2.1	0-10
Beryllium				
Boron				
Cadmium	0.00	0.00	NC	0-10
Calcium				
Chromium	0.800	0.00	100.0(a)	0-10
Cobalt				
Copper	0.900	0.00	100.0(a)	0-10
Gold				
Iron				
Lead	0.00	0.00	NC	0-10
Magnesium				
Manganese				
Molybdenum				
Nickel	1.00	1.30	30.0 (a)	0-10
Palladium				
Platinum				
Potassium				
Selenium	0.00	0.00	NC	0-10
Silicon				
Silver	0.00	0.00	NC	0-10
Sodium				
Strontium				
Thallium				
Tin				
Titanium				
Tungsten				
Vanadium				
Zinc	16.8	18.4	9.5	0-10

Associated samples MP19630: MC13780-3, MC13780-5, MC13780-7, MC13780-9

SERIAL DILUTION RESULTS SUMMARY

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19630 Methods: SW846 6010C
Matrix Type: AQUEOUS Units: ug/l

Prep Date:

Metal

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested
(a) Percent difference acceptable due to low initial sample concentration (< 50 times IDL).

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19634 Methods: SW846 7470A
Matrix Type: AQUEOUS Units: ug/l

Prep Date: 09/08/12

Metal	RL	IDL	MDL	MB raw	final
Mercury	0.20	.011	.062	0.019	<0.20

Associated samples MP19634: MC13780-3, MC13780-5, MC13780-7

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19634
Matrix Type: AQUEOUS

Methods: SW846 7470A
Units: ug/l

Prep Date:			09/08/12					09/08/12	
Metal	BSP Result	Spikelot HGRWS1	% Rec	QC Limits	BSD Result	Spikelot HGRWS1	% Rec	BSD RPD	QC Limit
Mercury	3.1	3	103.3	80-120	3.0	3	100.0	3.3	20

Associated samples MP19634: MC13780-3, MC13780-5, MC13780-7

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19637 Methods: SW846 7470A
Matrix Type: AQUEOUS Units: ug/l

Prep Date: 09/10/12

Metal	RL	IDL	MDL	MB raw	final
Mercury	0.20	.011	.062	-0.035	<0.20

Associated samples MP19637: MC13780-9

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: MC13780
Account: LEA - Loureiro Eng. Associates
Project: PWCTEH:F & H Buildings Groundwater

QC Batch ID: MP19637
Matrix Type: AQUEOUS

Methods: SW846 7470A
Units: ug/l

Prep Date: 09/10/12 09/10/12

Metal	BSP Result	Spikelot HGRWS1	% Rec	QC Limits	BSD Result	Spikelot HGRWS1	% Rec	BSD RPD	QC Limit
Mercury	2.9	3	96.7	80-120	2.9	3	96.7	0.0	20

Associated samples MP19637: MC13780-9

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

8.3.2

8

Appendix E

Quality Assurance / Quality Control Documentation

APPENDIX E
QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION

2012 ANNUAL POST-REMEDIATION MAINTENANCE AND GROUNDWATER MONITORING REPORT

United Technologies Corporation
Pratt & Whitney Division
F&H Buildings
East Hartford, Connecticut

December 2012

Prepared for

UNITED TECHNOLOGIES CORPORATION
One Financial Plaza
Hartford, Connecticut 06101

Prepared by

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An Employee Owned Company

Comm. No. 88UT1.36

Table of Contents

TABLES

ATTACHMENTS

A**CRONYMS**

CSM	Conceptual Site Model
DEEP	Connecticut Department of Energy and Environmental Protection
DQA	Data Quality Assessment
DQO	Data Quality Objective
DUE	Data Usability Evaluation
EDD	Electronic Data Deliverable
EPA	United States Environmental Protection Agency
ERA	Environmental Resource Associates
ETPH	Extractable Total Petroleum Hydrocarbons
LEA	Loureiro Engineering Associates, Inc.
LCS	Laboratory Control Sample
IMS	Information Management System
LEA	Loureiro Engineering Associates, Inc.
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PCBs	Polychlorinated Biphenyls
PE	Performance Evaluation
PID	Photoionization Detector
QA/QC	Quality Assurance/Quality Control
RCP	Reasonable Confidence Protocol
RPD	Relative Percent Difference
RSR	Remediation Standard Regulation
SOP	Standard Operating Procedure
TCE	Trichloroethylene
VOCs	Volatile Organic Compounds

UNITS

µg/l	micrograms per liter

1. QUALITY ASSURANCE /QUALITY CONTROL SUMMARY

During the course of the 2012 Post-Remediation Groundwater Monitoring activities, analytical and observational data were obtained for the F&H Buildings Remediation Area (hereinafter referred to as the "Project Area"). These data included analytical data on groundwater samples, field activities documentation, sample tracking documentation, and other documentation associated with sample collection and analysis.

During the course of groundwater monitoring activities, the need to maintain accurate and complete documentation was a paramount concern. Included in this document is a description of the activities undertaken to document, manage, verify, organize, and present the data compiled; a discussion of the types and quantities of Quality Assurance/Quality Control (QA/QC) samples that were collected during field activities; and an evaluation of the analytical data generated as a result of laboratory QA/QC procedures. The evaluation of laboratory QA/QC information includes a Data Quality Assessment (DQA) and a Data Usability Evaluation (DUE) that was performed in accordance with the methodology described in the November 2007 guidance document entitled, *Reasonable Confidence Protocols* and presented in more detail in the May 2009 document (revised December 2010) entitled *Laboratory Quality Assurance Quality Control, Data Quality Assessment, Data Usability Evaluation Guidance Document* published by the Connecticut Department of Energy and Environmental Protection (DEEP), as revised.

2. DATA MANAGEMENT PROCEDURES

This section has been organized to present those activities performed by personnel to document the record of post-remediation groundwater monitoring activities performed in the field and discuss the QA/QC activities performed in the field. These discussions are followed by a description of the activities undertaken by office personnel to ensure the necessary data have been accumulated, that the data have been properly managed, tracked, verified, entered into the database, presented appropriately, and at the conclusion of monitoring events, filed for future use.

2.1 Standard Operating Procedures

Prior to conducting groundwater monitoring activities at the Project Area, Standard Operating Procedures (SOPs) had been developed by Loureiro Engineering Associates, Inc. (LEA) for the most common procedures associated with the sampling and analysis of various media for environmental investigations. Development of these SOPs has taken into account the need for precision, accuracy, completeness, representativeness, and comparability of data.

Although it is understood that there are limits on data accuracy and precision that are inherent in the collection and analysis of samples and in the operation of measuring devices, adherence to standard procedures increases consistency and the level of confidence with which the data collected are evaluated. Data collected under standard procedures can also be used more reliably in comparing results over time on a given project, or from other projects or published information.

Data evaluation is also dependent upon the representativeness of the samples or measurements collected and the completeness of information associated with collection of the data. Collection and measurement techniques identified in the SOPs have been designed to take these factors into account, thus increasing the level of confidence that can be placed in the data.

Although adherence to SOPs is imperative for the successful completion of any project, there will be instances where exceptions to the SOPs must be made to obtain reliable data. When exceptions are made, documentation of both the situation requiring deviation and the actual deviation in procedure was recorded in the field documentation.

Each SOP was developed by LEA personnel experienced in the performance of the specific activity. At least two senior-level people, one being the Director of Quality, reviewed the SOP to ensure that the identified procedures satisfy the stated objectives and that the prescribed

procedures are technically correct, appropriately applied, and in conformance with applicable regulatory criteria and standard practices. These individuals signified their approval by signing and dating the SOP.

SOPs for the following activities have been included as Attachment E-1 of this document.

- Low Flow Sampling;
- Liquid Sample Collection and Field Analysis; and
- Quality Assurance/Quality Control Measures for Field Activities.

2.2 Field Quality Assurance Procedures

Field QA/QC procedures begin with the use and maintenance of field equipment and instrumentation and include the proper calibration of the equipment.

2.2.1 Use and Maintenance of Field Equipment and Instrumentation

Field equipment and instruments were operated and maintained in a manner that is consistent with the manufacturer's recommended practices. Deviations from standard use of the equipment or required repairs or adaptations made in the field were noted in the Field Record. Operation and maintenance manuals for equipment were kept in a single location that was known and accessible to personnel that would be likely to use the equipment.

Field personnel either returned equipment in a condition that permitted its optimal use on the following day of field operations, or notified the appropriate personnel so that repairs or replacements could be arranged in an expedient fashion. The use of expendable equipment was recorded and reported to appropriate personnel so replacements could be ordered in a timely manner and an adequate supply was available.

Prior to starting a particular field investigation, the field services manager or designated personnel ensured that adequate supplies and equipment were available for project completion. It was the responsibility of field personnel to inform the field services manager or other authorized personnel that supplies were depleted and that re-ordering was necessary.

2.2.2 Calibration Procedures and Frequency

Instruments and equipment were calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results were consistent with the appropriate manufacturer's specifications or project-specific requirements. Calibration was performed at intervals

recommended by the manufacturer or more frequently, as conditions dictated. The field instruments that required calibration during the groundwater monitoring activities included the photo-ionization detector (PID); the pH, dissolved oxygen, oxidation-reduction potential, and specific conductance sensors of the flow-through cells; and the turbidity meters. Documentation of the calibration that was performed was recorded on field documentation forms, analytical records, or other appropriate daily record of activities.

2.2.3 Decontamination

Decontamination procedures are described in applicable SOPs presented in Attachment E-1. These procedures were designed to avoid cross-contamination between samples, the transport of contaminated material between onsite locations, and the transport of contaminated material from onsite or off-site locations. As described in Section 3.2 of this appendix, equipment blanks were collected to confirm the efficiency of decontamination procedures.

2.3 **Sample Tracking**

Sample tracking activities focus on the timely assignment and tracking of information relevant to field samples collected during the groundwater sampling activities. Samples collected during the groundwater sampling activities were designated using the procedures discussed below.

Field sample tracking included the following tasks:

- Assignment of sample identification numbers and other sample identifiers to new samples to be taken, and entry to a tracking system;
- Production of sample bottle labels from the tracking system;
- Completion of chain-of-custody forms, and entry of this information to the tracking system;
- QA checking of the sample tracking information, and processing of change requests; and,
- Production of tracking reports and summary sheets, with distribution to appropriate project staff.

A computer-based sample-tracking system, based on a dBase® database computer program, was used for sample tracking.

2.3.1 Sample Location Identification

Samples were designated with location identifiers previously assigned using the procedure described in the SOPs included in Attachment E-1. In general, sample identification information included the sample type (e.g. monitoring well) and the sample point number.

Monitoring wells have been provided with location identifiers using a systematic method to prevent duplication of location identifiers. Additionally, a two letter prefix identifying F Building or H Building ("FB" or "HB") was also included in the location identifiers. For example, monitoring well number 1 located within the F Building Study Area is designated as FB-MW-01. The system of location identifiers provides a relatively easy means of finding the referenced locations on Project Area drawings.

2.3.2 Sample Labeling and Custody

Prior to sample collection, project-specific sample numbers were obtained, and labels were generated with all required information, as noted in the sample collection SOPs. Each sample was labeled using waterproof ink on a computer-generated label, and sealed immediately after collection. At a minimum, each sample label contained the following information:

- Project number;
- Date;
- Sample number; and
- Time of sample collection.

In order to ensure accurate identification of all sample containers, sample labels and tags were firmly affixed to the sample container. The sampler was responsible for ensuring that the sample container was dry enough for the label to remain securely attached, or used a suitable transparent adhesive tape when the adhesive labels were not applicable or there was any question as to whether the gummed label would be secure.

All sampling information was recorded on the field sampling records. Written chain-of-custody procedures were followed whenever samples were collected, transferred, stored, analyzed, or destroyed. The objective of these procedures was to create an accurate written record that could be used to trace the possession and handling of the samples from the point of collection through analysis. A sample was determined to be in someone's "custody" under any of the following conditions:

- It was in one's actual possession;
- It was in one's view, after being in one's physical possession;
- It was placed and kept in a locked location after being in one's physical possession; and
- It was kept in a secured area that is restricted to authorized personnel only.

Each time sample custody changed hands, the chain-of-custody form indicated that change. All efforts were made to limit the number of people involved in the collection and handling of samples. The field sampler was responsible for the care and custody of the samples collected until they were transferred under the appropriate chain-of-custody procedures. Specific chain-of-custody procedures are described in the LEA SOP for *Quality Assurance/Quality Control Measures for Field Activities* included in Attachment E-1 of this document.

2.3.3 Field Documentation

Daily Field Reports and other project information tracking forms were used to record general field data collection activities or pertinent field observation or occurrences. These forms consist of the loose-leaf field documentation forms completed daily by field crews. Entries were made in waterproof ink and each page was consecutively numbered for each sampling day. Each daily entry included the following information:

- Name of person recording information;
- Names of all field personnel;
- Project name and number;
- Date;
- Start and end times;
- Weather conditions;
- Equipment used;
- Samples collected;
- Field parameters measured; and,
- Equipment calibration performed.

Other information that was recorded in the field logs included the level of personal protective equipment used, difficulties, accidents, incidents, equipment problems or malfunctions, or deviations from proposed scope of work.

Any corrections made in the field logs were crossed out, not erased, and initialed by the person making the correction. Each page of the logs was signed by the person responsible for recording information on that day. All lines on a page, and all pages, were used or crossed out and initialed. This information was transmitted from field to office personnel at the end of each working day, or as soon thereafter as possible, for input into LEA's Information Management System (IMS). The Daily Field Reports and forms, in turn, were placed in the central project file.

2.3.4 Mapping

The location of each monitoring well was previously surveyed by a State of Connecticut licensed surveyor. All of the information used to locate sampling points within the Project Area was transferred to AutoCAD® drawings that served as the base maps for data presentation in this report.

2.4 Field Sampling Quality Assurance

QA samples were collected in general accordance with the LEA SOP for *QA/QC Measures for Field Activities*, included in Attachment E-1 of this document. The purpose of the QA samples is to confirm the reliability and validity of the field data gathered during the course of the groundwater monitoring activities. Field duplicate samples were used to provide a measurement of the consistency of samples collected from the same monitoring well and an estimate of variance and bias. Trip blank samples and equipment blank samples were used to provide a measurement of cross-contamination sources and decontamination efficiency, respectively, for groundwater sampling. Performance Evaluation (PE) samples were used to assess the overall accuracy and bias of the analytical methods being used and provide an indication of overall laboratory performance. Section 3 provides a discussion of the QA/QC sampling results.

2.5 Sample Shipping

Following sample collection, the filled sample containers were placed in coolers and packed appropriately to avoid bottle breakage. Either freezer packs or ice packed in re-sealable plastic bags or plastic containers were placed in the coolers to keep the samples at a temperature less than or equal to 4° Celsius during transport. At the end of each sampling day, samples were

picked up by the analytical laboratory's courier service or brought back to LEA's Plainville, Connecticut, office and placed into LEA's External Laboratory Refrigerator for pick up the next day by the analytical laboratory's courier service.

2.5.1 Samples Submitted for Laboratory Analysis

Groundwater samples collected and submitted to the laboratory for analysis were appropriately labeled and logged on chain-of-custody forms. Copies of completed chain-of-custody records for samples submitted for analysis or archiving were submitted to the Project Manager's designee at the end of each working day or as soon thereafter as possible.

2.5.2 Laboratory Analytical Results

The analytical results provided by the laboratory were provided in electronic data deliverable (EDD) format as well as .pdf format to the Project Manager's designee. After documentation of receipt of the results, the EDD was entered into the electronic database by the Database Team.

2.6 **Database Management**

The electronic analytical database was maintained in the LEA IMS in a dBASE® format. The database management functions are described in the following paragraphs.

2.6.1 Database Administration

Database administration included coordination of data entry and verification and review of data for completeness and correctness. The Database Team interfaced with the Project Manager and field personnel to ensure that the database met the project objectives.

2.6.2 Electronic Data Entry

The EDD files provided by the analytical laboratory were uploaded to the electronic analytical database by the Database Team. Data received from the laboratory in electronic format were checked for completeness by comparing data received with data analyses requested in the chain-of-custody forms. Analytical data were verified to assure the accuracy of the EDD, as compared to the analytical laboratory reports. Data verification involved having a qualified person manually check a printout from the database against the laboratory reports. Any deviations from the laboratory reports were reported to the Database Team, and the subsequent changes re-checked to verify their accuracy. In addition, the sample identification number, location, constituent, and qualifier codes were verified.

2.6.3 Archiving of Electronic Data

Archiving of the database was routinely accomplished. Data were backed up on a no-less-than weekly basis. The permanent archive for the analytical and geological/hydrological data is both electronic and hard copy files maintained by LEA.

2.6.4 Data Verification

The field personnel performed an initial review of data obtained from field measurements. This review consisted of checking procedures utilized in the field, ensuring that field measurement instruments were properly calibrated, verifying the accuracy of transcriptions, and comparing data obtained in the field to historic measurements. Field records were subsequently reviewed following completion of each day's field activities for completeness and consistency.

An internal review of analytical data was the responsibility of laboratory personnel. The analyst initiated the data review process by examining and accepting the data. The data reviewer then reviewed the completed data package. The data reviewer provided a technical review for accuracy and precision according to the methods employed and laboratory protocols. The data package was also reviewed for completeness (i.e., all pertinent information is included, all appropriate forms are signed and dated, calculations are correct, and holding times and quality control sample acceptance criteria have been met). A final review of the data was provided by the Project Manager's designee to ensure that the data package met the project specifications.

2.7 **Data Presentation**

The objective of data presentation was to illustrate the analytical data for the Project Area in formats that facilitated data interpretation and visualization. These formats include tables, figures, and drawings, as appropriate.

2.7.1 Analytical Data Presentation

Use of the electronic database for storage and retrieval of a wide range of both sample collection and analytical information maximized the ease and accuracy of data review and presentation. Tables of analytical and sampling information were produced in multiple formats to assist in the data evaluation process. Examples of analytical data presentations incorporated in this report include tabular listings of analyses conducted, sorted by location and sample identification number, and summaries of exceedances of tabulated numeric criteria in the DEEP's Remediation Standard Regulations (RSRs).

2.7.2 Facility Drawings

Facility drawings were created using AutoCAD® software. Base maps were generated using available information provided by Pratt & Whitney.

2.8 **File Organization**

Files of original analytical data obtained during the groundwater monitoring events were maintained throughout data evaluation process and ultimately archived in a central file. Incoming data were logged into the project file both on the project analytical database and on hardcopy and then were appropriately placed in the file. Analytical results from the laboratories were keyed electronically to the sample identification numbers assigned during sample collection. Original field documentation forms, paper copies of laboratory reports, and other project files information were transferred from the project file to a designated archive location upon the completion of the project. Computerized data were stored in both hard copy and electronic formats.

3. QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA/QC samples collected during the 2012 Post-remediation Groundwater Monitoring Program included duplicate groundwater samples; equipment blank samples; trip blank samples and PE samples. The duplicate samples, equipment blanks, and PE samples were analyzed for the same suite of constituents as the field samples, and trip blank samples were analyzed for volatile organic compounds (VOCs) only.

3.1 Field Duplicate Samples

Field duplicate samples were collected to provide a measure of the reproducibility of field sampling and laboratory analytical methodologies. Duplicate samples were coded in a fashion that did not alert the laboratory to the fact that the samples are replicates. Consistency between analytical results for field duplicate samples indicates consistent field sampling, sample handling, and analytical laboratory procedures. The consistency between field duplicate pairs is often measured by calculating the relative percent difference (RPD) for detects in a field duplicate pair when a compound was reported at greater than two times the reporting limit in both samples. Field duplicate precision was met when the RPD was less than or equal to 30 % for aqueous samples (which is based upon the United States Environmental Protection Agency (EPA) Region I Tier II Validation Guidance). If the RPD exceeded the acceptable limit, the affected compound(s) results were considered to be estimated values (no directional bias) and data usability was evaluated based on the project objectives. The RPD is calculated using the following formula:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} \, x\, 100\%$$

where X_1 and X_2 represent the two reported concentration measurements.

One duplicate groundwater sample was collected during each quarterly monitoring event and was submitted for analysis for VOCs, extractable total petroleum hydrocarbons (ETPH), polychlorinated biphenyls (PCBs), and metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc). A summary of sampling and analytical information for duplicate samples is presented in Table E-1, and a summary of all analytical results for duplicate samples, including the computed RPD values for each pair, is presented in Table E-2.

3.1.1 Volatile Organic Compounds

There was one instance in which VOCs were detected at concentrations greater than two times the reporting limit. The detections reported for 1,1,1-trichloroethane yielded an RPD of 2.1. Therefore, the results of the duplicate samples collected are considered acceptable.

3.1.2 Extractable Total Petroleum Hydrocarbons

There were no instances in which ETPH was detected at concentrations greater than two times the reporting limit. Therefore, an RPD assessment could not be performed.

Polychlorinated Biphenyls

PCBs were not detected in any of the groundwater samples collected. Therefore, an RPD assessment could not be performed.

3.1.3 Metals

There were no instances in which metals were detected at concentrations greater than two times the reporting limit. Therefore, an RPD assessment could not be performed.

3.2 Equipment Blank Samples

Equipment blank samples are used to indicate if any cross-contamination of samples between uses of sampling equipment or contamination to samples from disposable equipment may have occurred. Equipment blank samples are collected by pouring laboratory-provided water (analyte-free, de-ionized) through and/or over decontaminated or disposable sampling equipment into appropriate containers. The criteria for evaluating equipment blank samples were such that no target compound should be present at or above the reporting limit in any given equipment blank.

One equipment blank sample was collected during the September 2012 monitoring event and submitted to the laboratory for analysis for VOCs, ETPH, PCBs, and metals. No constituents were detected in the equipment blank sample collected in 2012. A summary of equipment blank sampling and analytical information is provided as Table E-3.

3.3 Trip Blank Samples

Trip blank samples are used to indicate if any cross-contamination between samples or contamination from other sources of VOCs may have occurred during transport, storage, or

laboratory analysis of samples. Trip blanks were prepared by Accutest Laboratories (Accutest) using ultra-pure, de-ionized water and submitted to the sampling team whenever glassware was delivered. A trip blank accompanied all project VOC sample containers through all custody changes in possession, coolers and refrigerators. The trip blanks were never opened by the sampling team.

One trip blank sample was submitted to the laboratory for analysis on the day that the samples were collected. No constituents were detected in the trip blank sample that was analyzed during the 2012 sampling event. A summary of trip blank sampling and analytical information is provided as Table E-3.

3.4 Performance Evaluation Samples

Double blind aqueous PE samples were submitted to Accutest in September 2012 monitoring event during the completion of a separate groundwater sampling event conducted on the Pratt & Whitney East Hartford Site within the Willow Pond Project Area. The results reported for this set of PE samples may be used to evaluate the analytical data collected for the F&H Buildings Project Area based on the facts that the PE samples were analyzed during the same timeframe and both projects utilized the same laboratory for analysis (Accutest). PE sample results are used to assess the overall accuracy and bias of the analytical methods being used and provide an indication of overall laboratory performance. Data for the PE samples also provided information about the magnitude and direction of quantitative bias for the laboratory methods, including sample preparation (extraction and cleanup) and analysis (chromatography and calibration).

The PE samples for this project were prepared by Environmental Resource Associates (ERA) of Arvada, Colorado. All results for PE samples were compared with vendor-certified acceptance limits. The PE samples results were evaluated for pass and fail. Fails were categorized as bias high, bias low, false negatives, and false positives. Performance evaluation sample certified values and results of the performance sample evaluation are included as Attachment E-2. The following is a summary of the performance evaluation samples results by analytical class.

- **Volatile Organic Compounds**: An evaluation of the results obtained against vendor-specified acceptance standards indicated that each of the VOC constituents (tetrachloroethylene, trichloroethylene, vinyl chloride, cis-1,2-dichloroethylene and trans-1,2-dichloroethylene) was outside of the acceptable vendor-certified limits. All of these VOC concentrations were reported higher than the acceptable limits. In addition, a false positive result was reported for chloroform. It is noted that none of these constituents were detected in the samples analyzed as part of the F&H Buildings sampling program.

LEA is currently investigating the detections and has requested that Accutest Laboratories and ERA perform an internal QA/QC review for the VOC results reported.

- **Polychlorinated Biphenyls:** PCBs were reported by the laboratory within the vendor-certified limits.

- **Extractable Total Hydrocarbons:** ETPH were reported by the laboratory within the vendor-certified limits.

- **Metals:** All metals were reported by the laboratory within the vendor-certified acceptable limits.

4. ASSESSMENT OF LABORATORY QA/QC INFORMATION

All data were analyzed using the Connecticut Reasonable Confidence Protocols (RCPs), which are analytical methods based on the respective Environmental Protection Agency (EPA) methods. The RCPs provide specific requirements for QA/QC that the laboratory must follow during analysis of environmental samples. In addition, the RCP methods require the laboratory to report the QA/QC analytical data associated with the analysis of each sample in the laboratory report and further require that the laboratory provide a narrative of any non-conformances for QA/QC data the were outside the acceptable limits for such data, as described in the specific RCP method.

QA/QC information provided by laboratories was evaluated with respect to quality by conducting a DQA and DUE in accordance with the methodology described in the November 2007 guidance document entitled *Reasonable Confidence Protocols* and in more detail in the May 2009 document (revised December 2010) entitled *Laboratory Quality Assurance Quality Control, Data Quality Assessment, Data Usability Evaluation Guidance Document*. The DQA process is intended to assess the quality of the analytical data generated by the laboratories. The DUE is performed to determine, once the quality of the analytical data is known, whether the quality of that data will affect its usability for the intended purpose.

4.1 Data Quality Assessment and Usability

The DQA was performed to assess the quality of the analytical data in each laboratory analytical report package. The DQA resulted in identifying data for which the quality could affect its potential use in decision-making. The DUE, which took into account the objectives for the data collection effort, and the intended use of the data, was performed using the information developed during the DQA. The RCP Data Quality Assessment Summary Reports that were generated during that assessment process are included as Attachment E-3.

Each analytical data package was reviewed in accordance with the DQA review process. Several deficiencies were noted. These included:

- Results for Laboratory Control Sample (LCS)) for VOCs were reported outside the accepted range of variability; and
- Recovery for surrogates was reported outside the accepted range of variability for PCBs in a single equipment blank sample.

After the laboratory analytical data were evaluated during the DQA, a DUE was performed. The DUE took into account the following:

- the site-specific conceptual site model (CSM);
- knowledge of the contaminant types, concentrations, and distribution;
- objectives for the data collection effort and the intended use of the data (i.e. the data quality objectives (DQOs)); and
- results from field QA/QC sampling.

Deficiencies that resulted in a possible low bias that have the potential to affect the interpretation of the data collected and therefore require more detailed evaluation are presented below.

Low percent recoveries were reported for 1,2,4-trichlorobenzene (69%), trans-1,4-dichloro-2-butene (50%), naphthalene (50%) and 2,2-dichloropropane (53%) in the LCS associated with groundwater samples collected in September 2012, indicating a possible low bias. Given the degree with which they were below the acceptable QA/QC limits and that these constituents are not constituents of concern, the possible low bias did not affect decision making.

One PCB surrogate was reported with a low recovery of 23%, indicating a possible low bias. PCBs were not detected in the equipment blank sample or in any of the groundwater samples collected during the sampling event, nor in any groundwater samples collected as part of the post-remediation groundwater monitoring program. Given this and that if proper decontamination procedures were followed, PCBs would not be detected in the equipment blank sample, the possible low bias did not affect decision making.

In general, the QA/QC deficiencies identified related to constituents that are not identified as constituents of concern for the Project Area. Taking into consideration multiple lines of evidence, results from the DUE indicated that the data generated during the 2012 groundwater sampling events were usable for the intended purpose.

TABLES

Table E-1
SUMMARY OF DUPLICATE SAMPLING AND ANALYTICAL INFORMATION
Pratt & Whitney, East Hartford, Connecticut
2012 F&H Buildings Annual Groundwater Monitoring Report

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Sample Information					Analysis Information							
Location ID	Sample ID	Sample Date	Sampled Interval (ft)	Sample Class	Analyt. Lab.	Volatile Organics	Semivolatile Organics	Herbicides	Pesticides/ PCBs	Fuels/Oils	Metals	Miscellaneous Analyses
HB-MW-08	1263256	09/06/2012	7.00 - 17.00	GWS		X			x	X	X	
HB-MW-08	1263257	09/06/2012	7.00 - 17.00	GWS		X			x	x	X	

Printed on 12/06/2012

Table E-2
SUMMARY OF ANALYTICAL RESULTS - FIELD DUPLICATES
Pratt & Whitney, East Hartford, Connecticut
2012 Annual F&H Builidngs Groundwater Monitoring Report

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	Location ID	HB-MW-08	HB-MW-08	RPD (%)	.			
	Sample ID	1263256	1263257					
	Sample Date	09/06/2012	09/06/2012					
	Sample Time	12:17	12:17					
	Sample Depth	7.00' - 17.00	7.00' - 17.00					
	Laboratory	ACTM	ACTM					
	Lab. Number	MC13780-6	MC13780-8					
Constituent	Units							
Date PCBs Analyzed	-	09/13/2012	09/13/2012					
Date Metals Analyzed	-	09/10/2012	09/10/2012					
Date Organics Analyzed	-	09/12/2012	09/12/2012					
Date Physical Analyzed	-	09/10/2012	09/10/2012					
Arsenic (unfiltered)	mg/L	<0.0040 U	<0.0040 U					
Barium (unfiltered)	mg/L	0.0699	0.0695	0.57				
Cadmium (unfiltered)	mg/L	<0.0040 U	<0.0040 U					
Chromium, Total (unfiltered)	mg/L	<0.01 U	<0.01 U					
Copper (unfiltered)	mg/L	<0.025 U	<0.025 U					
Lead (unfiltered)	mg/L	<0.0050 U	<0.0050 U					
Mercury (unfiltered)	mg/L	<0.00020 U	<0.00020 U					
Nickel (unfiltered)	mg/L	<0.04 U	<0.04 U					
Selenium (unfiltered)	mg/L	<0.01 U	<0.01 U					
Silver (unfiltered)	mg/L	<0.0050 U	<0.0050 U					
Zinc (unfiltered)	mg/L	<0.02 U	<0.02 U					
Arochlor 1016	ug/L	<0.26 U	<0.26 U					
Arochlor 1221	ug/L	<0.26 U	<0.26 U					
Arochlor 1232	ug/L	<0.26 U	<0.26 U					
Arochlor 1242	ug/L	<0.26 U	<0.26 U					
Arochlor 1248	ug/L	<0.26 U	<0.26 U					
Arochlor 1254	ug/L	<0.26 U	<0.26 U					
Arochlor 1260	ug/L	<0.26 U	<0.26 U					
Arochlor 1262	ug/L	<0.26 U	<0.26 U					
Arochlor 1268	ug/L	<0.26 U	<0.26 U					
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	0.0979	<0.090 U					
Naphthalene	ug/L	<5.0 U	<5.0 U					
1,2-Dichloropropane	ug/L	<2.0 U	<2.0 U					
Acetone	ug/L	<5.0 U	<5.0 U					

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	Sample Time	12:17	12:17					
	Sample Depth	7.00' - 17.00	7.00' - 17.00					
	Laboratory	ACTM	ACTM					
	Lab. Number	MC13780-6	MC13780-8					
Constituent	Units							
Acrylonitrile	ug/L	<5.0 U	<5.0 U					
2-Hexanone	ug/L	<5.0 U	<5.0 U					
Benzene	ug/L	<0.50 U	<0.50 U					
1,2,3-Trichlorobenzene	ug/L	<5.0 U	<5.0 U					
1,2,4-Trichlorobenzene	ug/L	<5.0 U	<5.0 U					
1,2,4-Trimethylbenzene	ug/L	<5.0 U	<5.0 U					
o-Dichlorobenzene	ug/L	<1.0 U	<1.0 U					
1,3,5-Trimethylbenzene	ug/L	<5.0 U	<5.0 U					
m-Dichlorobenzene	ug/L	<1.0 U	<1.0 U					
p-Dichlorobenzene	ug/L	<1.0 U	<1.0 U					
Bromobenzene	ug/L	<5.0 U	<5.0 U					
Butyl Benzene	ug/L	<5.0 U	<5.0 U					
Chlorobenzene	ug/L	<1.0 U	<1.0 U					
Ethylbenzene	ug/L	<1.0 U	<1.0 U					
Isopropylbenzene (Cumene)	ug/L	<5.0 U	<5.0 U					
Propylbenzene	ug/L	<5.0 U	<5.0 U					
sec-Butylbenzene	ug/L	<5.0 U	<5.0 U					
tert-Butylbenzene	ug/L	<5.0 U	<5.0 U					
Hexachlorobutadiene	ug/L	<5.0 U	<5.0 U					
Methyl Ethyl ketone	ug/L	<5.0 U	<5.0 U					
trans-1,4-Dichlorobutene	ug/L	<5.0 U	<5.0 U					
Carbon Disulfide	ug/L	<5.0 U	<5.0 U					
Carbon Tetrachloride	ug/L	<1.0 U	<1.0 U					
4-Isopropyltoluene	ug/L	<5.0 U	<5.0 U					
1,1,1,2-Tetrachloroethane	ug/L	<5.0 U	<5.0 U					
1,1,1-Trichloroethane	ug/L	4.8	4.9	2.1				
1,1,2,2-Tetrachloroethane	ug/L	<1.0 U	<1.0 U					
1,1,2-Trichloroethane	ug/L	<1.0 U	<1.0 U					

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	Sample Time	12:17	12:17					
	Sample Depth	7.00' - 17.00	7.00' - 17.00					
	Laboratory	ACTM	ACTM					
	Lab. Number	MC13780-6	MC13780-8					
Constituent	Units							
1,1,2-Trichlorotrifluoroethane	ug/L	<5.0 U	<5.0 U					
1,1-Dichloroethane	ug/L	<1.0 U	<1.0 U					
Ethylene Dibromide	ug/L	<2.0 U	<2.0 U					
1,2-Dichloroethane	ug/L	<1.0 U	<1.0 U					
Chloroethane	ug/L	<2.0 U	<2.0 U					
Methyl tert-Butyl ether	ug/L	<1.0 U	<1.0 U					
1,1-Dichloroethylene	ug/L	<1.0 U	<1.0 U					
trans-1,2-Dichloroethylene	ug/L	<1.0 U	<1.0 U					
cis-1,2-Dichloroethylene	ug/L	<1.0 U	<1.0 U					
Vinyl Chloride	ug/L	<1.0 U	<1.0 U					
Tetrachloroethylene	ug/L	<1.0 U	<1.0 U					
Tetrahydrofuran	ug/L	<10 U	<10 U					
Bromomethane	ug/L	<2.0 U	<2.0 U					
Bromodichloromethane	ug/L	<1.0 U	<1.0 U					
Chloromethane	ug/L	<2.0 U	<2.0 U					
Chlorodibromomethane	ug/L	<1.0 U	<1.0 U					
Methylene Dibromide	ug/L	<5.0 U	<5.0 U					
Methylene Chloride	ug/L	<2.0 U	<2.0 U					
Dichlorodifluoromethane	ug/L	<2.0 U	<2.0 U					
Bromoform	ug/L	<1.0 U	<1.0 U					
Chloroform	ug/L	<1.0 U	<1.0 U					
Trichlorofluoromethane	ug/L	<1.0 U	<1.0 U					
Methyl Isobutyl ketone	ug/L	<5.0 U	<5.0 U					
1,2,3-Trichloropropane	ug/L	<5.0 U	<5.0 U					
1,2-Dibromo-3-Chloropropane	ug/L	<5.0 U	<5.0 U					
1,3-Dichloropropane	ug/L	<5.0 U	<5.0 U					
sec-Dichloropropane	ug/L	<5.0 U	<5.0 U					
1,1-Dichloropropene	ug/L	<5.0 U	<5.0 U					

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	Laboratory	ACTM	ACTM					
	Lab. Number	MC13780-6	MC13780-8					
Constituent	Units							
trans-1,3-Dichloropropene	ug/L	<0.50 U	<0.50 U					
cis-1,3-Dichloropropene	ug/L	<0.50 U	<0.50 U					
Styrene	ug/L	<5.0 U	<5.0 U					
Toluene	ug/L	<1.0 U	<1.0 U					
o-Chlorotoluene	ug/L	<5.0 U	<5.0 U					
p-Chlorotoluene	ug/L	<5.0 U	<5.0 U					
Trichloroethylene	ug/L	<1.0 U	<1.0 U					
o-Xylene	ug/L	<1.0 U	<1.0 U					
Xylenes,m- & p-	ug/L	<1.0 U	<1.0 U					
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Table E-3
SUMMARY OF EQUIPMENT AND TRIP BLANK SAMPLING INFORMATION
Pratt & Whitney, East Hartford, Connecticut
2012 F&H Buildings Annual Groundwater Monitoring Report

Loureiro
Engineering • Construction • EH&S • Energy • Waste

Sample Information					Analysis Information							
Location ID	Sample ID	Sample Date	Sampled Interval (ft)	Sample Class	Analyt. Lab.	Volatile Organics	Semivolatile Organics	Herbicides	Pesticides/ PCBs	Fuels/Oils	Metals	Miscellaneous Analyses
EQUIPMENT	1263258	09/06/2012		BKE		x			x	x	x	
TRIP BLANK	1263259	09/06/2012		BKT		x						

Printed on 12/06/2012

ATTACHMENT E-1

LEA Standard Operating Procedures

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Liquid Sample Collection and Field Analysis

SOP ID: 10004
Date Initiated: 02/20/90
Revision No. 006: 12/31/01

Approved By: ***/s/ Joseph T. Trzaski*** ***12/31/01***
Joseph T. Trzaski **Date**
Senior Scientist

/s/ Nick D. Skoularikis ***12/31/01***
Nick D. Skoularikis **Date**
Director of Quality

REVISION RECORD

Rev #	Date	Additions/Deletions/Modifications
Initial Issue	2/20/90	
001-004	NR	No record.
005	01/15/99	No record.
006	12/31/01	Updated to conform to new SOP format. Minor revisions throughout.

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Liquid Sample Collection and Field Analysis

1. Purpose and Scope

This document describes procedures to be followed for measurement of static water level elevations, detection of immiscible layers, well evacuation, sample withdrawal, and field analyses.

2. Definitions

2.1. Immiscible layers: The term is used to denote free-phase liquids that may be present in the aquifer as a result of a release. These liquids may have a density lighter than water (light non-aqueous phase liquids (LNAPL) or floaters) or heavier than water (dense non-aqueous phase liquids (DNAPL) or sinkers).

3. Equipment

3.1. Equipment required for the collection and field analysis of liquid samples includes:

- Water-level indicator (accurate to 0.01 foot). The size of the instrument depends on the size of the wells being monitored.
- Distilled water.
- Hand towels.
- Portable volatile organic compound (VOC) analyzer (Photovac MicroTIP®, Foxboro OVA® or equivalent).
- Interface probe, clear polyvinyl chloride (PVC) or fluorocarbon resin bailer (if required).
- pH and temperature meter (capable of accuracy to 0.1 pH unit).
- Specific conductivity meter.
- Bailers (clean or disposable) with disposable nylon or polyethylene rope.

- Polyethylene plastic sheeting.
- Polyethylene tubing, and appropriate pumping apparatus such as centrifugal pump, Wattera® pump with fluorocarbon resin foot valve, peristaltic pump with appropriate tubing, submersible pump or other appropriate pumping apparatus.
- Clean disposable gloves.
- Field paperwork.
- Sample collection jars.
- Indelible marker.
- Cooler(s) with ice or ice packs.
- Site-specific Health and Safety Plan (as applicable).
- Site-specific work plan, work instructions, drawings (as applicable).
- Personal protective equipment (as may be required by Site Specific Health and Safety Plan).
- Aluminum foil (if field decontamination is expected).
- Appropriate containers for collection of purge water (bucket, carboy, 55-gallon drum etc.).

4. Procedures

Immediately upon opening the well, the air in the wellhead should be sampled for VOCs using a portable VOC analyzer, such as a Photovac MicroTIP®. The well cap shall be opened slightly and the sampling port of the VOC analyzer shall be inserted into the well. The maximum reading shall be recorded on the appropriate field paperwork. The instrument shall be zeroed with ambient air prior to the measurement, and the initial and final readings shall be recorded for each well.

Measures shall be taken during well sampling to prevent surface soils from coming in contact with the purging equipment and lines. Typically, a polyethylene sheet is placed on the ground providing adequate coverage for the equipment being used.

4.1. Detection of Immiscible Layers

4.1.1. If the presence of immiscible layers is suspected or unknown, the sampling event shall include provisions for detection of immiscible phases prior to well evacuation or sample collection. Lighter and/or

denser immiscible phases may be encountered in a groundwater monitoring well.

4.1.2. An interface probe will be used to determine the existence of any immiscible layers, light or dense. Alternatively, a clear fluorocarbon resin or PVC bailer may be used to determine the existence of the phases or oil sheen in the well when no accurate determination of the immiscible layer thickness is required. For Geoprobe® wells smaller than 1" in diameter, an interface probe cannot be introduced into the well. A small diameter disposable bailer can be used to determine the existence of any immiscible layers. Alternatively the initial water purged from a well will be collected and evaluated visually for the presence of immiscible layers.

4.1.3. If immiscible layers were encountered, the levels of the immiscible liquids shall be measured to an accuracy of 0.02 feet using an electronic interface probe capable of detecting the interfaces between air, product, and water. The interface levels shall be recorded in the field notebook. Adjustments of the observed head to the theoretical hydraulic head shall be calculated based on the density conversion factor associated with the particular non-aqueous phase liquid.

4.1.4. If required, the immiscible layers and groundwater shall then be purged into 55-gallon 17H DOT drum, which shall be labeled and characterized for disposal. The immiscible layer shall be collected prior to any purging activities.

4.2. Measurement of Static Water Level

4.2.1. The static water elevations in each well shall be measured prior to each sampling event. This is performed initially to characterize the site, and in subsequent sampling rounds to determine whether horizontal or vertical flow gradients have changed. A change in hydrologic conditions may necessitate modification of the groundwater monitoring program.

4.2.2. Remove the protective cover and locking cap.

4.2.3. Each well shall have a surveyed reference point located at the top of the well casing with the locking cap removed. The reference point shall be easily recognizable, since the personnel conducting the sampling may differ from one sampling event to the next. If no distinguishable reference point is present, the measurements shall be

taken from the highest point on the well casing. The absence of a reference point and subsequent reference point used for the measurements shall be recorded on the field paperwork.

4.2.4. The following parameters shall be measured with an accuracy of 0.01 ft:

- Depth to standing water.
- Depth to bottom of well.

4.2.5. A water-level indicator will be used for measurement. Due to possible pressure differences between the well atmosphere and the ambient atmosphere, the water level will be allowed to equilibrate for 15 minutes following removal of the well cap. The results shall be recorded in the appropriate location(s) on the appropriate field forms.

4.2.6. Total depth measurements will be compared to original depths to determine the degree of siltation that may have occurred. This information shall be noted on the field form. Should significant siltation occur in any well, the well may need to be redeveloped by an approved method. This information will also be used to confirm that the proper well is being sampled (in case of cluster wells).

4.2.7. The portion of the tape immersed in the well shall be decontaminated during retrieval using a distilled water rinse followed by drying with a clean wipe, prior to use in another well. This decontamination procedure shall be amended, as needed, to accommodate the specific type of contamination anticipated.

4.3. Field Analysis

4.3.1. Parameters that are physically or chemically unstable shall be measured immediately after collection using a field test meter or other equipment. Parameters such as pH, temperature, specific conductivity, and turbidity will be measured in the field, at the temperature of the well sample. The measurement of additional parameters may be required dependent upon sampling methods or other site-specific conditions.

4.3.2. A combination of pH/temperature/specific conductivity meters shall be used. The meter shall be calibrated prior to use and at the end of the day using calibration solutions, in accordance with the instructions provided in the instrument's operating manual. Whenever a

questionable reading ("spike") is observed the calibration shall be checked. The calibration shall be checked prior to sampling each well or well cluster. Calibration information to be recorded in the field paperwork shall include the temperature, pH, and conductivity readings in each calibration solution before and after each calibration.

The pH/temperature/conductivity meters shall be placed into a sample and allowed to stabilize for a minimum of twenty seconds. The accuracy of measurement shall be 0.1 standard units for pH, and 0.1E Celsius for temperature. For conductivity, the accuracy shall be as stipulated by the range of the instrument. The sample shall be discarded in an appropriate manner upon completion of the analysis.

4.3.3. The pH/temperature/specific conductivity meters shall be decontaminated using a distilled/deionized water rinse between each sample. To the extent possible, the same probe and meter shall be used for all measurements at a given site for the duration of monitoring at the site.

4.3.4. Turbidity of the sample will be measured using a DRT turbidimeter, Model 15C or equivalent, that has been calibrated in accordance with the instructions provided in the instrument's manual. The accuracy of the measurement shall be to 1 NTU (nephelometric turbidity unit).

4.4. Well Evacuation

4.4.1. Calculate standing water in the well based on the following schedule and record on the appropriate field form:

Well Diameter (inches)	Conversion Factor (gal/feet)
½	0.01
1	0.041
1 ¼	0.064
1 ½	0.091
2	0.163
4	0.654
6	1.47

4.4.2. Generally, a centrifugal, submersible, air-lift, bladder, inertial, or peristaltic pump equipped with a fluorocarbon resin or PVC foot valve on the end of dedicated tubing, as appropriate, may be used to evacuate the monitoring wells. Alternatively, evacuation of the wells may be accomplished using a bailer.

4.4.3. A new sheet of polyethylene plastic shall be placed on the ground adjacent to the well. Sampling and purging equipment, such as pump, tubing, bailers and bailer twine, containers, etc., shall be placed on the polyethylene sheet, never on the ground.

4.4.4. Don disposable gloves, prepare pump and tubing for insertion into the well, ensuring that any tubing or pump apparatus is of sufficient length to reach the appropriate depth for pumping. Pumping shall occur within the well screened interval as indicated on the well construction diagram. If the well construction information is not available, the bottom of the tubing or pump shall be placed 1' - 2' above the bottom of the well.

4.4.5. Lower the pump and/or tubing gently into the water column to the appropriate depth and begin pumping.

4.4.6. Measure pH, temperature, specific conductivity, turbidity and other specific parameters in the well from the first water extracted during the purging process.

4.4.7. Remove a volume of water equal to 3 to 5 times the standing water from the well measured into an appropriate container. Purging of the well shall occur at a slow rate to minimize agitation of the water recharging the well.

4.4.8. If it is not possible to remove three volumes as described above, due to slow recovery of the well, the well shall be emptied and allowed to recover. In slow-yielding wells, whenever full recovery exceeds two hours, the sample shall be extracted as soon as a sufficient volume is available for a sample for each parameter.

4.4.9. Measure pH, temperature, specific conductivity, turbidity and other specific parameters **prior** to sampling.

4.4.10. Well evacuation is deemed to be complete when the following criteria have been met:

- pH measurements vary no more than ± 0.5 standard units.
- Specific conductivity measurements vary no more than ± 10%.
- Temperature measurements vary no more than ± 1EC.
- Turbidity measurements (if used) are below 5 NTU, if practicable.

Alternatively well purging shall be deemed complete if a maximum of five well volumes have been removed from the well and/or other site-specific or method-specific parameters have stabilized.

4.4.11. Measure pH, temperature, specific conductivity and turbidity (and other specific parameters) again **after** sampling to determine the effectiveness of purging and sample stability.

4.4.12. Do **not** re-use purging equipment (bailers, rope, tubing, sampling vials, etc.). Any non-disposable bailers shall be returned to the office for decontamination. Pumps shall be decontaminated between monitoring wells, in accordance with procedures noted in Section 4.7.

4.4.13. Bailer twine and other consumables, such as filter apparatus, shall be disposed of appropriately.

4.4.14. Record sampler's name, sampling time, volume of water purged, parameters measured, weather conditions, sample number, analyses required and all other pertinent information on appropriate field forms, and complete the chain of custody form. The field paperwork shall also provide an indication of other field conditions that could potentially impact water levels (such as a pond being drained, or presence of a beaver dam in nearby surface water).

4.4.15. As dictated by project-specific requirements and/or groundwater quality considerations, any water purged from the monitoring wells shall be stored in properly labeled containers for disposal.

4.4.16. Storage shall be in properly labeled containers approved for storage of hazardous materials, and in an appropriate designated location at the site.

4.5. Sample Withdrawal

4.5.1. In order to ensure that the groundwater sample is representative of the formation, it is important to minimize physical alteration (i.e. agitation during purging and/or sample collection) or chemical contamination of the sample during the withdrawal process. The sample set shall include enough dedicated bailers and sample jars to obtain samples from each well, and additional quality assurance/quality control (QA/QC) samples such as duplicates, trip blanks and equipment blanks. In addition, it is recommended to increase the supply of

sampling equipment and sample jars by about 10% to account for missing or broken glassware.

4.5.2. Use either an appropriate pump or bailer to purge each well (the same pump used for purging may be used for sample withdrawal, with the exception that samples intended for VOC analysis must be collected using either a bailer or a bladder pump.). Do not reuse a bailer in the field; used non-disposable bailers shall be returned to the office for decontamination.

4.5.3. To minimize agitation of the water column, samples shall be collected from the pump tubing in the following order into pre-labeled sample containers:

- Extractable organics (semi-volatile).
- Total petroleum hydrocarbons (TPH).
- Poly chlorinated biphenyls (PCBs).
- Metals.
- Phenols.
- Cyanide.
- Chloride and sulfate.
- Nitrate and ammonia.
- Turbidity.
- Radionuclides.

Samples to be analyzed for the following constituents shall be collected using a bailer, after any pump and tubing have been removed from the well. Removal of any down hole equipment shall be done carefully and in a manner that minimizes disturbance of the water column.

- Volatile organic compounds (VOCs).
- Purgeable organic carbon (POCs).
- Purgeable organic halogens (POX).
- Total organic halogens (TOX).
- Total organic carbon (TOC).

4.5.4. Samples shall be obtained from the monitoring wells as soon as possible after purging. This may require waiting an extended period for low-yielding wells.

4.5.5. Samples collected for VOC analysis shall be free of any air bubbles and inverted upon filling. Bacterial samples shall be collected using dedicated gloves; taking care not to allow anything to touch the inside of the sampling container.

4.5.6. Samples collected for dissolved metals analysis, which are to be filtered in the field, shall be passed through a 0.45 micron (maximum) filter (either in-line or under negative pressure) prior to placement in the sample bottle.

4.5.7. In situations where replicate samples shall be required, care shall be taken to ensure that each sample collected is independent.

4.5.8. In some situations, inorganic parameters may be sampled directly from a pump after completion of well evacuation procedures.

4.6. Post Sampling Procedures

4.6.1. As required, upon completion of all sampling procedures for a particular site, secure the lid of the cooler using packaging tape with the chain of custody inside.

4.6.2. If the laboratory is local, transport the samples directly to the laboratory and present them to the sample manager. The representative of LEA should witness the verification of the chain of custody and obtain a carbon copy for filing in the project notebook.

4.6.3. If the laboratory is distant, arrange for transport with a reputable carrier service. Typically, the laboratory specifies the carrier to be used and provides the shipping papers. The cooler and samples shall be secured for transport, and all mailing documentation secured onto the top of the cooler. Unless otherwise specified, delivery shall be overnight. Friday shipments should be mailed for Saturday delivery, once confirmed that the laboratory can accept them on Saturday. The laboratory shall provide confirmation of acceptance noting the temperature of the temperature blank and any deviations from the chain of custody.

4.7. Field Documentation

4.7.1. Field documentation shall include at a minimum: a chain-of-custody form, Field Data Record Groundwater Form, Sample Collection Form, Daily Field Report, Field Quality Review Checklist. Sample labels shall be used for proper sample identification.

4.7.1.1. The labels shall be sufficiently durable to withstand immersion for 48 hours without detaching and to withstand normal handling. The information provided shall be legible at all times.

4.7.1.2. The following information shall be provided on the sample label using an indelible-ink pen:

- Sample identification number.
- LEA Commission Number.
- Date and time of collection.
- Place of collection.
- Parameter(s) requested (if space permits).

4.7.1.3. A field logbook and/or appropriate field forms will be used to log all pertinent information with an indelible-ink pen. The following information shall be provided:

- Project and site identification.
- LEA commission number.
- Identification of well.
- Static water level measurement technique.
- Presence of immiscible layers and detection method.
- Time well purged.
- Collection method for immiscible layers and sample identification numbers.
- Well evacuation procedure/equipment.
- Sample withdrawal procedure/equipment.
- Date and time of collection.

- Types of sample containers used and sample identification numbers.
- Preservative(s) used.
- Parameters requested for analysis.
- Field analysis method(s).
- Whether or not field filtration was performed and the filter size, if appropriate.
- Field observations on day of sampling event.
- Record of site activities.
- Field personnel.
- Climatic conditions, including air temperature.
- Status of total production.
- Record of non-productive time.
- Name of all visitors to the site related to the project.

4.7.1.4. The chain-of-custody record shall include the following information:

- Company's name and location.
- Date and time of collection.
- Sample number.
- Container type, number, size.
- Preservative used.
- Signature of collector.
- Signatures of persons involved in the chain of possession.
- Analyses to be performed.
- Type and number of samples.

A separate entry shall be made for each sample, and within each sample each case that a different preservative is used.

4.7.1.5. The Field Data Record Groundwater Form shall be updated during the sampling of each well and include the following information:

- Identification of well.
- Well depth, diameter, depth to water.
- Static water level depth and measurement technique.
- Purge volume and pumping rate.
- Time well purged.
- LEA commission number.
- Date.

4.8. Equipment Decontamination

All materials and equipment, which enter a well, must be clean and free of any potential contaminants. In general, the equipment and materials entering the well shall be unused and preferably disposable. Any items not considered disposable should be decontaminated prior to commencing field activities. If field decontamination is required, the choice of decontamination procedures shall be based upon knowledge of the site-specific contaminants and as outlined in the site-specific work plan.

For sites at which the contaminants are unknown, but contamination is suspected, the decontamination procedures outlined below shall be followed.

4.8.1. Prior to commencing any field activities, the following solutions (as appropriate for the appropriate contaminants) shall be prepared and placed into 500-ml laboratory squirt bottles: 10% methanol in water; 10% nitric acid in water; 100% n-hexane; distilled, de-ionized water.

4.8.2. In the field, prepare approximately 2.5 gallons of a solution of Alconox® (or other suitable non-phosphate laboratory grade detergent) in tap water in a 5-gallon bucket.

4.8.3. Prepare a piece of 5-mil polyethylene sheeting to underlie the decontamination area. The sheeting shall be of sufficient size to contain any accidental discharge of decontamination solutions. The plastic shall be bermed to contain spills.

4.8.4. The order for decontaminating equipment is as follows:

1) Detergent scrub.
2) DI water rinse.
3) Hexane rinse (to be used only if separate-phase petroleum product, other than gasoline, is present).
4) DI water rinse.
5) 10% nitric acid rinse (to be used only when metals are suspected as potential contaminants).
6) DI water rinse.
7) Methanol rinse (<10% solution).
8) Air dry.

4.8.5. Materials considered disposable such as the bailer cord, pump tubing, filters, etc. shall not be decontaminated and shall be disposed of in accordance with all applicable municipal, state, and federal regulations.

4.8.6. Wrap each piece of decontaminated equipment in aluminum foil, as appropriate, to maintain cleanliness.

4.8.7. At the end of the project day, dispose of all spent decontamination fluids and materials such as the polyethylene sheeting and personal protective equipment in accordance with all applicable municipal, state, and federal regulations.

5. Quality Assurance/Quality Control

Typically samples taken for Quality Assurance/Quality Control for liquid sample collection include duplicate samples, equipment blanks and trip blanks. The necessity for these samples will be outlined in the site-specific work plan. In general, all QA/QC measures taken during liquid sample collection shall be in conformance with LEA's standard operating procedure (SOP) ID 10005. Standard QA/QC measure shall include the recording of pertinent information as follows:

5.1. The Field Instrument & Quality Assurance Record, which is a portion of the Daily Field Report, shall include the following information:

- Instrument make, model, and type.
- Calibration readings.
- Calibration/filtration lot numbers.
- Field personnel and signature.

5.2. The Field Quality Review Checklist, which is a portion of the Daily Field Report, shall assure the completeness of the sampling round and include the following information:

- Reviewer's name and date.
- Review of all necessary site activities and field forms.
- Statement of corrective actions for deficiencies.

6. References

6.1. EPA, *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*, OSWER 9950.1, September 1986.

6.2. EPA, *Practical Guide for Groundwater Sampling*, EPA/600/2-85/104, September 1985.

6.3. DEP, Site Characterization Guidance Document, Draft, June 12, 2000.

END OF DOCUMENT

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Quality Assurance/Quality Control Measures
for
Field Activities

SOP ID: 10005
Date Initiated: 02/20/90
Revision No. 004: 12/31/01

Approved By: ***/s/ Jeffrey J. Loureiro*** ***12/19/01***
Jeffrey J. Loureiro **Date**
President

/s/ Nick D. Skoularikis ***12/19/01***
Nick D. Skoularikis **Date**
Director of Quality

REVISION RECORD

Rev #	Date	Additions/Deletions/Modifications
Initial Issue	02/20/90	
001-003	-	No record.
004	12/31/01	Updated to reflect new SOP format. Added section 4.3, Results Evaluation. Minor revisions throughout.

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Quality Assurance/Quality Control Measures
for
Field Activities

1. Statement of Purpose

This document describes procedures to be followed for proper Quality Assurance Quality Control (QA/QC) practices which shall incorporate all activities associated with sampling tool and instrument preparation, field measurements and sampling, proper documentation of field and post-field activities, QC sample preparation, chain-of-custody protocol and laboratory analytical procedures. The use of specific QA/QC measures is project-specific as defined in the project work plan. This standard operating procedure (SOP) was adopted in accordance with the Environmental Protection Agency (EPA) document *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846).

2. Definitions

2.1. Trip Blank: An aliquot of organic-free water or equivalent neutral reference material carried into the field but not exposed.

2.2. Equipment Blank: An aliquot of analyte-free deionized water processed through all sample collection equipment.

2.3. Replicate Samples: Samples that have been divided into two or more portions in the field.

2.4. Collocated Samples: Independent samples collected under identical circumstances in a way that they are equally representative of the parameter of interest.

2.5. Performance Evaluation (PE) Sample: A sample that mimics actual samples in all possible aspects, except that its composition is known to the auditor and unknown to the analyst.

3. Equipment

None

4. Procedure

4.1. General

4.1.1. All QA/QC sample preparation procedures shall be properly documented including:

- Name of person(s) or laboratory involved in sample preparation.
- Reagents used.
- Sample number.
- Analyses required.
- Concentration calculations.
- Accuracy of measurements.
- Number, type, size of containers used.
- Preservation method.
- Date and time of sample preparation.

4.1.2. All information shall be included in the field logbook and/or appropriate field forms, but not necessarily in the chain-of-custody record except as needed for proper sample identification and analysis. Blind sample numbers are being used in order not to disclose the nature of the sample to the laboratory. No information that would identify the sample as a QA/QC sample shall be included in the chain-of-custody record.

4.1.3. At the conclusion of each sampling day, a quality control review shall be conducted using the Field Quality Review Checklist and the Daily Field Report.

4.2. QC Sample Preparation

4.2.1. Trip Blank

4.2.1.1. Contaminated trip blanks may indicate contamination of the samples during the field trip or shipment to the lab, cross-contamination between the samples, contaminated sample vials, or improper handling.

4.2.1.2. Trip blanks shall be used only with samples that are to be analyzed for volatile organic compounds.

4.2.1.3. One trip blank shall be included per shipping container (cooler) carrying sample soil and/or groundwater samples that are to be analyzed for volatile organic compounds

4.2.1.4. Trip blanks are prepared using analyte-free deionized organic-free water prior to field activities associated with the sampling event, usually by the laboratory providing the sampling containers. Each trip blank is placed in a 40-ml glass VOA vial and is carried in the same shipping container as the sample(s). Trip blanks should not be opened at any time during transport.

4.2.2. Equipment Blank

4.2.2.1. The purpose of an equipment/rinsate blank is to determine if decontamination procedures were adequate or if any of the equipment might contribute contaminants to the sample.

4.2.2.2. An equipment blank is prepared by running analyte-free deionized water through all sample collection equipment (bailers, pumps, filters, split-spoon) and placing it in the appropriate sample containers for analysis. If equipment has been decontaminated in the field, the equipment blank shall be collected after decontamination procedures have been performed.

4.2.2.3. Equipment blanks shall be used when sampling surface water, groundwater, soil, and sediment.

4.2.2.4. One equipment blank shall be collected for each sample bottle/preservation technique/analysis procedure per matrix per sampling event, or as otherwise specified in project-specific documents.

4.2.3. Replicate Samples

4.2.3.1. Replicate samples provide precision information on handling, shipping, storage, preparation and laboratory analysis.

4.2.3.2. Replicate samples are samples that have been divided into two or more portions in the field. An example of a replicate sample is two identical sample bottles filled with water from the same bailer retrieval. To ensure homogeneity, the bailer should be emptied into a clean, decontaminated beaker used exclusively

for the purpose and containing sufficient volume for both sample containers, and from that into the sample containers.

4.2.3.3. Replicate samples cannot be used when sampling for volatile organic compounds.

4.2.3.4. One replicate sample shall be obtained for each sample bottle/preservation technique/analysis procedure per sampling event or one out of every 20 samples, unless collocated samples are used (see below), or as otherwise specified in project-specific documents.

4.2.4. Collocated Samples

4.2.4.1. Collocated samples provide precision information on sample acquisition, homogeneity, handling, shipping, storage, preparation and laboratory analysis.

4.2.4.2. Collocated samples are independent samples collected in such a way so that presumably they are equally representative of the parameter of interest. Examples of collocated samples are groundwater samples collected sequentially, soil core samples collected side-by-side, or air samples collected essentially at the same time from the same manifold.

4.2.4.3. Collocated samples are especially useful when sampling for volatile organic compounds, for which replicate samples cannot be used.

4.2.4.4. Collocated samples shall be obtained for each sample bottle/preservation technique/analysis procedure per sampling event or one out of every 20 samples, unless replicate samples are used (see above), or as otherwise specified in project-specific documents.

4.2.5. Split Samples

4.2.5.1. The purpose of split samples is to provide an assessment of the laboratory analytical procedure.

4.2.5.2. Split samples are collocated or replicate samples sent to two (or more) different laboratories.

4.2.5.3. Split samples can be used with any sample media. Split samples can be used in conjunction with spiked samples (see

below). In case contradictory results are obtained from the samples split between different laboratories, the spiked samples can be used to verify the analytical data (provided that the spiked samples were properly prepared and the appropriate documentation is available).

4.2.5.4. When used, one split/spiked sample per sample bottle/preservation technique/analysis procedure per sampling event or every 20 samples shall be included, or as specified in project-specific documents.

4.2.6. Spiked Samples

4.2.6.1. The purpose of spiked samples is to provide information on the precision of the laboratory analytical procedure. However, besides a wrong preparation, several other sources of error exist such as analyte stability, holding time and interactions with the sample matrix.

4.2.6.2. Spiked samples are samples spiked with the contaminants of interest. The compounds used for spiking should be of the same chemical group as the contaminants being investigated, but they do not have to be the exact chemical compounds. Spiking should be carefully designed and performed prior to the field investigations. Field matrix spikes are not generally recommended because of the high level of technical expertise required for proper preparation and documentation.

4.2.6.3. Can be used with any sample media, however, liquid matrices are preferred due to uniformity of mixing.

4.2.6.4. When used, one split/spiked sample per sample bottle/preservation technique/analysis procedure per sampling event or every 20 samples shall be included, or as otherwise specified in project-specific documents. In order to ensure defensible data, performance evaluation (PE) samples, prepared by an independent vendor, are typically being used. The ordering and handling procedures and record keeping requirements are discussed in Loureiro Engineering Associates, Inc. (LEA's) *SOP for Preparation of PE Samples* (SOP 10030).

4.3. Result Evaluation

4.3.1. The analytical results on QA/QC samples should be evaluated along with the remaining analytical data as follows:

4.3.1.1. No constituents should be detected in the trip blank or equipment blank.

4.3.1.2. The relative percent differences (RPDs) shall be computed for all constituents detected in both duplicate samples used.

The RPD between two measurements (e.g., M1 and M2) is calculated as follows:

$$RPD = \frac{| M1 - M2 |}{(M1 + M2) / 2} \; x \; 100\%$$

4.3.1.3. Any deviations in the performance evaluation samples shall be brought to the attention of the laboratory. An investigation shall then be performed by the laboratory of the method used, laboratory QA/QC procedures followed, and computations performed. The laboratory shall report the results of their investigation and any corrective actions taken.

5. References

5.1. EPA, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846).

END OF DOCUMENT

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Installing and Developing Monitoring Wells and Piezometers

SOP ID: 10007
Date Initiated: 02/20/90
Revision No. 006: 08/12/02

Approved By: _____ 8/12/02
Joseph T. Trzaski **Date**
Senior Scientist

_____ 08/12/02
Nick D. Skoularikis **Date**
Director of Quality

REVISION RECORD

Rev #	Date	Additions/Deletions/Modifications
Initial Issue	02/20/90	
001-004	-	No record.
005	12/31/01	Formatting and minor revisions throughout.
006	08/12/02	Added section on utility clearance.

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Installing and Developing
Monitoring Wells and Piezometers

1. Purpose and Scope

This standard operating procedure (SOP) is designed to describe the methods and procedures used to install and develop monitoring wells and piezometers in a water-table aquifer. Monitoring well and piezometer installation and development shall generally follow the guidelines presented in the "*Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells*" (United States Environmental Protection Agency (EPA), 1989), the "*RCRA Ground Water Monitoring Technical Enforcement Guidance Document*" (EPA, 1986), and any state or local guidance, or regulatory documents which are available.

This SOP describes general procedures and guidelines to be followed or consulted for the proper methods to be used when installing monitoring wells or piezometers in unconsolidated deposits and bedrock. Because each site is unique and the purpose of the monitoring wells may vary from installation to installation, no definitive rules can be established. Throughout this SOP reference to monitoring wells is also intended to mean piezometers unless specifically indicated otherwise. This SOP also applies to monitoring wells and piezometers installed by Geoprobe® direct push technologies.

2. Definitions

Geoprobe® Direct Push Machine: A vehicle-mounted, hydraulically-powered machine that uses static force and percussion to advance small-diameter sampling tools into the subsurface for collecting soil, vapor , or groundwater samples. Geoprobe® machines ad tools are manufactured by Geoprobe Systems®, Salina, Kansas.

Prepacked Well Screen (0.5 in and 1.5 in): An assembly consisting of a clotted polyvinyl chloride (PVC) pipe surrounded by environmental grade sand contained within a stainless steel wire mesh cylinder. The inner component of the prepacked screen is a flush-threaded, 0.5 inch Schedule 80 PVC pipe with 0.01 in slots. (Alternatively, a 1.5 inch Schedule 80 PVC pipe can be used). Stainless steel wire mesh with a pore size of 0.011 in makes up the outer component of the prepack. The space between the inner slotted pipe and outer wire mesh is filled with 20/40 mesh silica sand. Geoprobe®

prepacked screens are available in sections of various lengts (3 ft or 5 ft)and a nominal inside diameter of 0.5 in or 1.5 in.

3. Equipment and Decontamination

3.1. Equipment Supplied by the Drilling Contractor:

- Drilling rig.
- Monitoring well casing.
- Monitoring well screen.
- Bottom caps, plugs or points.
- Centering guides (if they are to be used).
- Filter pack sand.
- Bentonite.
- Cement-bentonite grout.
- Mud-scale to measure densities.
- Protective casing or road box.
- Steam-cleaning apparatus and supplies.
- Suitable containers (e.g., Department of Transportation (DOT)-approved 55-gallon drums with liners) for soil cuttings, well development water, and water generated from steam cleaning.
- Metal stamps for permanently marking wells.
- All necessary permits and licenses.
- If the Geoprobe® is used for well installation, Geoprobe®-specific equipment for well installation.

3.2. Equipment Supplied by Loureiro Engineering Associates, Inc. (LEA)

- Field forms.
- Indelible markers.
- Lock(s) and keys.
- Well development equipment (pumps, surge block, bailers, etc.).
- Analytical instrumentation (Analytical instrumentation includes, but is not necessarily limited to turbidity meters, pH meters, specific conductivity meters, and thermometers.).
- Calibration supplies for all analytical instrumentation, as appropriate.
- Alconox®, or other non-phosphate laboratory grade detergent.
- 5-gallon buckets.
- Decontamination brushes.
- Distilled, de-ionized water.
- Decontamination fluids (<10% methanol in water, 100% n-hexane, and

10% nitric acid).

3.3. Equipment Selection and Specifications

The following specifications will be followed:

Cement-Bentonite Grout: If cement-bentonite is utilized, the cement-bentonite grout will be a mixture of 95 pounds of Type II Portland cement, 4 to 6 pounds of powdered sodium bentonite, and 5 gallons of potable water. The bentonite must be thoroughly mixed with the water before the cement is added. The cement bentonite grout shall have a density of 14 pounds/gallon.

Filter Pack Sand: All filter pack sand will be clean, well-rounded silica sand, in factory-sealed bags. The sand will conform to the most recent version of the American Water Works Association (AWWA) Standard AWWA/ANSI A100 for water wells. In brief, the standard states that filter pack sand will have an average specific gravity of 2.5 with not more than 1% of the material having a specific gravity less than 2.25. Thin, flat or elongated particles shall not exceed 2% of the material, no more than 5% of the material shall be soluble in hydrochloric acid, and the material shall be washed and free of shale, mica, clay, dirt, loam, and organic impurities.

Bentonite: All bentonite will be pure, additive-free bentonite whether it is pellets, chips, or powder.

3.4. Equipment Decontamination

3.4.1. Equipment Decontamination for Monitoring Well Installation

All well materials and drilling equipment which are used to construct a monitoring well or piezometer must be clean and free of any potential contaminants. All well construction materials not certified by LEA personnel as decontaminated when delivered will be decontaminated by steam cleaning before being installed. Drilling equipment must also be decontaminated, prior to beginning work, by steam cleaning. Geoprobe® equipment shall be cleaned using a detergent such as Liquinox®.

All decontamination activities shall be completed at a specially constructed decontamination pad (or a portable decontamination unit). The decontamination pad shall be constructed before any drilling

activity begins. The pad shall be constructed of high-density polyethylene (HDPE) liner material, of sufficient size and strength to allow the drill rig access to the pad, and bermed to contain the generated wastewaters.

3.4.2. Equipment Decontamination for Sampling Equipment and Well Development.

All materials and equipment used to sample soil or which enter a well must be clean and free of any potential contaminants. In general, the choice of decontamination procedures shall be based upon the site-specific contaminants and outlined in the site-specific work plan.

For sites at which the contaminants are unknown, but contamination is suspected, the decontamination procedures outlined below shall be followed.

3.4.2.1. Prior to commencing any field activities, the following solutions (as appropriate for the anticipated contaminants) shall be prepared and placed into 500-ml laboratory squirt bottles: <10% methanol in water; 10% nitric acid in water; 100% n-hexane; distilled, de-ionized water. Other chemicals may be used for decontamination of site-specific contaminants if needed for decontamination of those contaminants.

3.4.2.2. In the field, prepare approximately 2.5 gallons of a solution of Alconox® (or other suitable non-phosphate laboratory grade detergent) in tap water in a 5-gallon bucket.

3.4.2.3. Prepare a piece of 5-mil polyethylene sheeting to underlie the decontamination area. The sheeting shall be of sufficient size to contain any accidental discharge of decontamination solutions. The plastic shall be bermed to contain spills. The decontamination for Geoprobe® equipment shall be performed in buckets or in tubs.

3.4.2.4. The order for decontaminating equipment is as follows:

1) Detergent scrub.
2) De-ionized (DI) water rinse.
3) Hexane rinse (to be used only if separate-phase petroleum product, other than gasoline, is present).
4) DI water rinse.

5) 10% nitric acid rinse (to be used only when metals are suspected as potential contaminants).
6) DI water rinse.
7) Methanol rinse (<10% solution).
8) Air dry.

The order of decontamination may change if different chemicals are used.

3.4.2.5. Disposable materials such as cord shall not be decontaminated and shall be disposed of after use.

3.4.3. At the end of the project day, all spent decontamination fluids and materials, such as the polyethylene sheeting and personal protective equipment, shall be managed and/or disposed of in accordance with all applicable municipal, state, and federal regulations.

4. Procedures

4.1. Utilities

4.1.1. Notify the appropriate "one call" utility notification service (e.g. Call Before You Dig at 1-800-922-4455, Contractor ID: 10502) at least three working days prior to commencing operations on a site. The locations of all proposed borings must be clearly marked in the field prior to notification. The Project Engineer/Manager **must** call and confirm that each utility has been to the site and has marked their respective lines.

4.1.2. On private sites, consult with the Owner or other person knowledgeable about the site as to the locations of potential private or abandoned utilities and locate these prior to beginning work. Upon the discretion of the Project Engineer/Manager, a pipe locator can also be used to assist in locating utilities.

4.1.3. Note that OSHA may have additional requirements for location of utilities.

4.1.4. All efforts to locate underground utilities (including names of owner or designee and time) should be properly documented in the field logbook prior to onset of the work scheduled.

4.2. OSHA

4.2.1. The Senior LEA representative shall be the Competent Person required by OSHA for all work. However, this does not relieve other LEA representatives from bringing to his or her attention conditions, which may be unsafe or present a hazard to the drilling crew, the general public, or other workers on the site.

4.3. Monitoring Well and Piezometer Installation

The specific monitoring well installation methodologies are dependent upon the specific drilling method used. In general, monitoring wells will be constructed through the inside of the drill stem, once the borehole has been advanced to the desired depth. For Geoprobe® monitoring wells, the wells will be constructed through the inside of stainless steel casing.

4.3.1. Borehole Advancement

If the borehole has been drilled to a depth greater than that at which the well is to be set, the borehole must be backfilled with bentonite pellets, bentonite chips, or a bentonite-cement slurry to a depth of approximately one foot below the intended well depth. Approximately one foot of clean sand must be placed on top of the backfill to return the borehole to the proper depth for the well installation.

For bedrock monitoring wells, the borehole shall be advanced to approximately one foot into competent bedrock and the isolation casing grouted into place. The grout is to be allowed to cure for at least 24 hours before drilling continues. After the grout has cured, the borehole is to be advanced using the appropriate technique (e.g., coring, air rotary, mud rotary) to the desired depth. If the borehole is advanced to a depth greater than that at which the well is to be set, the borehole shall be backfilled as described above.

For Geoprobe® installed wells and piezometers, the steel casing will be drilled to the specified depth of the bottom of the well using the Geoprobe® and in certain cases manually.

4.3.2. Installation of Well Screen and Casing

The appropriate lengths of well screen (with bottom cap, or plug, or well point) and casing must be joined watertight and carefully lowered inside the drill stem to the bottom of the borehole. If centering guides are used, they must be placed at intervals around the well casing, beginning no lower than 5 feet above the top of the screen.

4.3.3. Design and Installation of the Filter Pack

After the well screen and casing are installed in the borehole, the filter pack shall be installed. For monitoring wells in unconsolidated materials, the selection of the appropriate filter pack material shall be based upon a grain-size analysis of a sample collected from the intended screen interval. The selection of the appropriate filter pack material shall be based upon the methodologies presented in the "*Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells*" (EPA, 1989), the "*RCRA Ground Water Monitoring Technical Enforcement Guidance Document*" (EPA, 1986), or any state or local guidance, or regulatory documents which are available. In the absence of grain size analyses, the filter pack material shall be selected based upon an experienced geologist's best judgment as to the appropriate material.

For bedrock monitoring wells, the well screen and filter pack are emplaced primarily to stabilize the borehole and are therefore not sized in the same manner as for a monitoring well in unconsolidated sediments. For typical bedrock monitoring wells, 10-slot well screen is appropriate. The selection of the appropriate filter pack material shall be based upon the slot size selected for the well screen.

A filter pack of clean silica sand will be placed around the well screen. Place the filter pack into the borehole at a uniform rate in a manner that will allow even placement of the sand. The drill stem shall be raised slowly while the sand is being placed to avoid caving of the borehole walls; the drill stem shall never be raised above the top of the filter pack during installation. Using a stainless steel weight on the end of a fiberglass tape, continuously sound the top of the filter pack as it is being installed. The filter pack shall extend from a depth of approximately one foot below the screened interval to a minimum height of one to two feet above the top of the well screen. However, this length may be adjusted if it would create the potential for cross-contamination or in the case of shallow water tables.

A finer-grained sand cap shall be installed for a minimum of one foot above the filter pack. This height may also be adjusted in the case of shallow water tables.

4.3.4. Installation of Impermeable Seal

An impermeable seal at least two feet thick must be placed on top of the fine sand cap. The seal may be composed of either bentonite pellets or a bentonite slurry. The pellets must be placed into the borehole in a slow and continuous manner that prevents bridging. This is especially important in deeper monitoring wells where

the pellets may have to be emplaced through a considerable depth of standing water in the borehole.

The bentonite slurry shall be prepared by mixing approximately 15 pounds of bentonite powder with 7 gallons of water for each one cubic foot of slurry needed. The slurry shall be emplaced in the borehole via a tremie pipe. The tremie pipe must be plugged on the bottom and have openings along the sides of the bottom one foot of pipe. This will allow the slurry to be emplaced into the borehole without disturbing the fine sand cap. This procedure is especially important for the relatively deeper wells.

Verify the position of the top of the bentonite seal using a weighted tape measure. If all or a portion of the bentonite seal must be emplaced above the water table, hydrate the bentonite with clean water. Allow 30 minutes after adding the water for the bentonite to hydrate.

The thickness of the bentonite seal may be adjusted for wells completed in aquifers with shallow water tables.

4.3.5. Installation of Grout Backfill

Place an annular seal of cement-bentonite grout above the bentonite seal. Install the cement-bentonite grout continuously from the bottom of the annular space to the ground surface through a tremie pipe. The tremie pipe must be plugged on the bottom and have openings along the sides of the bottom one-foot length of pipe. This will allow the grout to be emplaced into the borehole without disturbing the bentonite seal. Alternatively, a bentonite slurry can be used.

4.3.6. Surface Completion

All monitoring wells will be finished at the surface with a concrete pad (Figure 1). The concrete pad shall typically be two-feet square and at least four inches thick. The concrete shall fill the borehole to a depth below the frost line. The pad shall be constructed in one continuous pour of concrete. Note that some of the cement-bentonite grout used for the annular seal may have to be removed to install the concrete pad. A survey pin may be installed in the concrete pad before it dries, if necessary.

For monitoring wells that will be completed above-grade, a locking steel protective casing shall be installed in the concrete. The protective casing shall extend at least three feet into the ground and two feet above ground. For monitoring wells that will be completed flush, a steel roadbox, suitable for traffic loads, with a gasketed cover and drain shall be installed.

Each well will be properly labeled on the exterior of the locking cap or protective steel casing with a metal stamp indicating the permanent well identifier.

4.3.7. Well Protection Bollards

Guard posts may be installed in high-traffic areas for additional protection. One to four guard posts would be installed around the protective casing, within the edges of the concrete pad. If used, guard posts will consist of concrete-filled steel tubes, at least 3 inches in diameter, painted with multiple coats of epoxy-based paint to prevent rust. The guard posts would extend at least two feet below ground and approximately three feet above ground.

4.3.8. Geoprobe® Prepacked Screen Monitoring Well Installation

The installation of prepacked screen monitoring wells in general follows the following four steps (Figure 2):

4.3.8.1. Anchoring the Well Assembly at Depth

In the first step, an expendable anchor point is driven to the desired depth on the end of a 2.125 outside diameter probe rod string. A prepacked screen assembly is inserted into the inside diameter of the rod string with 5-ft sections of PVC riser. The screens and riser pipe are attached to the anchor point via a snap-lock connector. If the monitoring well is to have a flush-mount finish, it is suggested to prepare a large enough hole to accept a standard well protector before driving the probe rods.

4.3.8.2. Providing a Sand Pack and Grout Barrier

The natural formation will sometimes collapse around the well screens as the probe rod string is withdrawn. This is frequently encountered in sandy formations below the water table. This provides an effective barrier between the screens and grout material used to seal the well annulus. If the formation does not collapse, a sand barrier must be placed from the surface while retracting the well casing. This procedure needs to be followed carefully to prevent the grout from reaching the well screens, potentially giving rise to non-representative samples.

Using a flat tape measure or water level sounder, determine the depth from the top of the PVC riser to the bottom of the annulus between the riser and probe rods. If unstable conditions have resulted in formation collapse (measured depth of 2 to 3 ft), then proceed to 4.3.8.3. if the borehole has not collapsed, then retract the casing to 1 ft above the screen while adding

sand. Take measurements with a weighted tape. Continue until 2 ft of sandpack have been established above the well screen.

4.3.8.3. Installing a Bentonite Seal above the Screen

Proceed as in section 4.3.4. above. Bring the bentonite seal to within 2 ft from ground surface to allow well completion

4.3.8.4. Installing Well Protection.

Proceed as in Section 4.3.6. above.

5. Well Development

Monitoring well development may be accomplished by surging and bailing (or pumping), or over pumping. Other methods, such as air jetting, backwashing, or air-lift pumping, shall be avoided because these methods introduce fluids into the formation and may have unexpected influences on groundwater quality, if only for a short period of time.

Immediately upon opening the well, the air in the wellhead will be sampled for VOCs using a portable VOC analyzer, such as a Photovac MicroTIP®. The well cap shall be opened slightly and the sampling port of the VOC analyzer shall be inserted into the well. The maximum reading shall be recorded on the appropriate field paperwork. The instrument shall be zeroed with ambient air prior to the measurement, and the initial and final readings shall be recorded for each well.

Measures shall be taken during well sampling to prevent surface soils from coming in contact with the purging equipment and lines. Typically, a polyethylene sheet is placed on the ground providing adequate coverage for the equipment being used.

In addition, the procedures described in LEA SOP ID 10004 in the sections for Field Analysis, Well Evacuation, and Sample Withdrawal shall be followed.

5.1. Surging and Bailing

In surging and bailing, a well is developed by alternately surging a short section of the screen with a tight-fitting surge block. Begin by lowering the surge block to the top of the screened interval and swab the well with a pumping action with a typical stroke of 2 to 3 feet. (Begin surging at the top of the well intake to avoid having loosened material from "sand-locking" the surge block.) Do not surge the well too violently to avoid damaging the well screen or the filter pack. Remove the surge block at regular intervals and bail (or pump) the fine material from the well. Proceed with surging throughout the length of the well screen, being careful

to avoid hitting the bottom of the well. Check the quality of the bailed water at regular intervals, as described in Section 5.3.

In cases where a considerable volume of sediment may initially be drawn into the well, begin surging the well gently in the casing above the well screen. Proceed with surging and bailing to the bottom of the screened interval.

5.2. Overpumping

In overpumping, a well is developed by operating a pump in the well at a capacity which greatly exceeds the formation's ability to supply water. The flow velocity into the well during overpumping usually greatly exceeds the flow velocity induced during normal sampling. This increased velocity causes movement of particles from the formation into the well.

Begin developing the well by installing a suitable pump at the bottom of the well. Alternatively, a surface-mounted pump with a suction hose may be used if the drawdown inside the well will not exceed the pump's available lift. The discharge from the pump shall be directed to approved containers. The pump (or intake hose) must be equipped with a backflow-prevention valve to prevent introducing aerated water into the aquifer.

Start the pump and discharge water at the highest practical rate. If the well runs dry, stop the pump and allow the well to recharge. Check the quality of the discharged water at regular intervals as described in Section 4.3.

5.3. Completing Well Development

During bailing or pumping, measure and record water quality parameters to gauge the degree and effectiveness of development. Typically, pH, temperature, specific conductivity, and turbidity shall be checked at periodic intervals (but at least every three well-volumes) until the purge water begins to appear clear. Then measurements shall be made after each well volume until the parameters stabilize. The water quality parameters may be considered stable when:

- pH, temperature, and specific conductivity of consecutive measurements have relative percent differences (RPD), as defined below, of less than 10%; and,
- The turbidity is 5 NTU or less (applicable only in aquifers with low percentages of fines. This may not be achievable in all situations, but the turbidity shall be less than 50 NTU and shall stabilize with an RPD of less than 10%).

However, in no case shall the development stop before the above criteria are met, and:

- At least 3 well volumes have been removed; or,
- The well has been surged and pumped for at least 30 minutes.

The RPD between two measurements (e.g., M1 and M2) is calculated as follows:

$$RPD = \frac{|M1 - M2|}{(M1 + M2)/2} \times 100\%$$

All well development equipment and supplies shall be thoroughly decontaminated prior to and between each monitoring well. Place all development water into properly labeled, suitable containers; leave all filled containers in an appropriate location.

6. Documentation

6.1. Well Development

Well development activities will be documented on the appropriate field forms, and specifically on the "Field Data Record Groundwater" and "Well Development Report" forms. Information provided on those forms includes: purge method, amount of water per well volume, instrument readings after purging of each well volume.

6.2. Monitoring Well Completion Log Forms

During the installation of a monitoring well, complete records must be kept of quantities and types of all well construction materials used.

A complete geologic log shall be kept during advancement of the borehole for the well. The procedures for completing geologic logs are presented in *Standard Operating Procedure for Geologic Logging of Unconsolidated Sedimentary Materials* (SOP ID 10015). However, the additional information pertinent to monitoring well installations shall be recorded on a separate form. A monitoring well completion form is provided in Attachment 1. In addition typical wellhead details – one for flush-mount well completions and one for above-grade completions - are provided as Figure 1. Whenever a monitoring well is installed, record all appropriate information concerning the quantity of materials used, the

type and manufacturer of the materials, the mixtures of grouts or slurries, and any pertinent notes regarding the installation of each well.

After the project is completed, submit a copy of the attached Geologic Soil Boring/Well Completion Log Request Form along with copies of all Monitoring Well Completion forms for final typing and entry into the LEA database. The request form provides information on the types of final logs to be produced, the scale at which to plot the final forms, and notes common to all reports.

7. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures will be followed in compliance with the site-specific work plan.

8. References

8.1. EPA, *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*, OSWER 9950.1, September 1986.

8.2 EPA, *Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells*, EPA/600/4-89/034, 1989.

8.3 Geoprobe, *Geoprobe® 0.5-in x 1.4 in OD and 0.75 in x 1.4 in OD Prepacked Screen Monitoring Wells, Standard Operating Procedure*, Technical Bulletin No. 962000, September 1996, revised; June 2002.

END OF DOCUMENT

ATTACHMENT 1

Monitoring Well Completion Report and Well Development Forms

WELL COMPLETION REPORT

Project: | **Start Date** | **Well ID**

LEA Comm. No.

Client | **End Date**

Location _____

Drilling Contractor _____ **Logged by**

Drilling Method _____ **Drilling Foreman** _____

Sampling Method _____ **Drill Rig** _____

Groundwater Observation **GPS Latitude** _____

Depth _____ **at** _____ **Hours** **GPS Longitude** _____

Protector
- Material _____
- Diameter _____
- Length _____ Ground
- Stickup _____
- Key # _____
- Cover Type _____

Top Seal
- Top _____
- Bottom _____
- Material _____

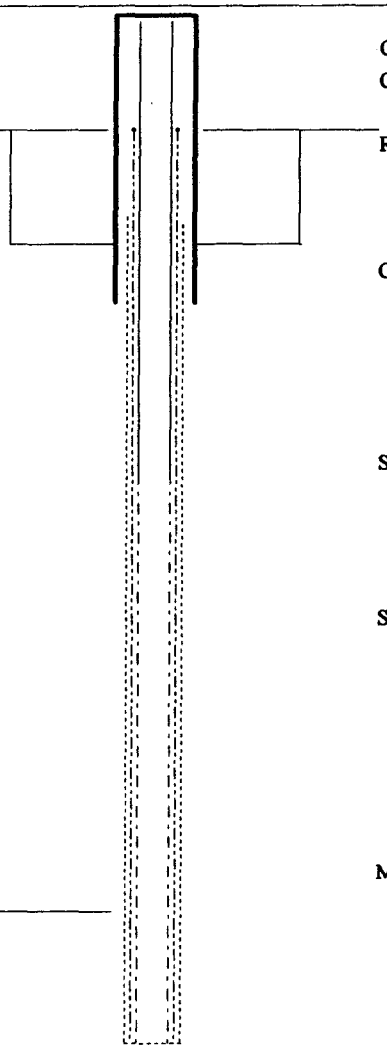
Backfill
- Top _____
- Bottom _____
- Material _____

Secondary Sand
- Top _____
- Bottom _____
- Size _____

Filter Pack
- Top _____
- Bottom _____
- Material _____

Reported depth to bottom of boring _____

Comments



Concrete Diameter _____

Concrete Thickness _____

Reference
- Stickup _____
- Description _____

Casing
- Diameter _____
- Material _____
- Length _____
- Stickup _____

Seal
- Top _____
- Bottom _____
- Material _____

Screen
- Top _____
- Bottom _____
- Material _____
- Diameter _____
- Length _____
- Slot Size _____

Miscellaneous Materials (Quantity Used/Item)
- Cement _____
- Bentonite Chips _____
- Bentonite Pellets _____
- Bentonite Powder _____
- Grout Weight _____
- Filter Pack Sand _____
- Capping Sand _____
- Well Point _____
- Well Plug _____

Signature _____

Loureiro Engineering Associates, Inc.

Loureiro Engineering Associates, Inc.

FIELD SAMPLING RECORD
WELL DEVELOPMENT

LEA Comm. No. Page _____ of _____
Project Date ___/___/_____
Location Time ___:___
Client

Monitoring Well Number _____ Sample Number(s) _____ _____

Initial Field Data and Measurements

Depth of Well _____ Reference Used _____
Depth to Water _____ PID/FID Reading _____
Height of Column _____ Interface Yes / No If yes, Depth _____ Lighter / Heavier

Well Casing Diameter _____ Material _____

Protector Road Box / Stickup
Ground to Reference _____
Comments _____

General Condition	OK	Bad
Casing Secure		
Collar Intact		
Cover Locked		
Other (describe)		

Development Information

Purge Volume Factors
0.5" - 0.01
1" - 0.041
1.5" - 0.091
2" - 0.16
4" - 0.65
6" - 1.5

Initial Sample Observations
Clear ☐
Colored ☐
Cloudy ☐
Turbid ☐
Odor ☐
Sheen ☐

Volumes \ Parameter	Gallons	Temp (C)	pH (SU)	Spec.Con.	Turbidity	Other
Initial						

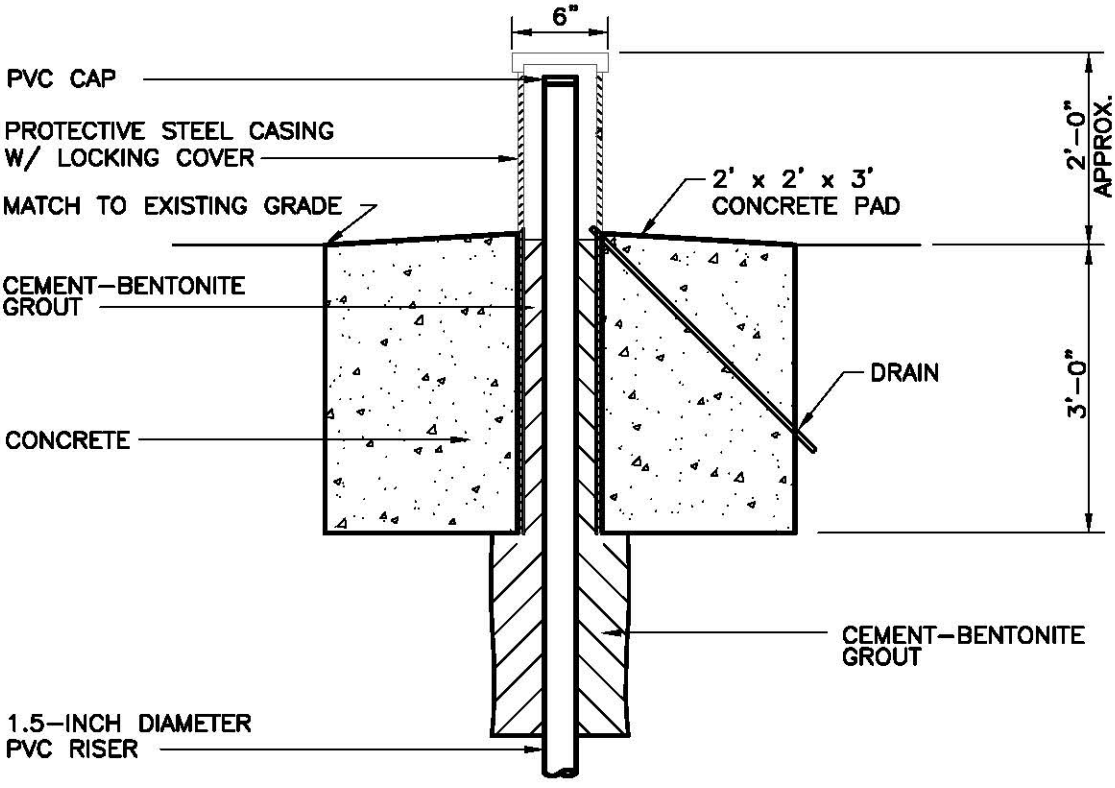
Developement Method Peristaltic Pump / Bailer / Inertial Pump / Other _____

Field Decontamination? Yes / No If Yes, with what? _____
Waste Container ID _____

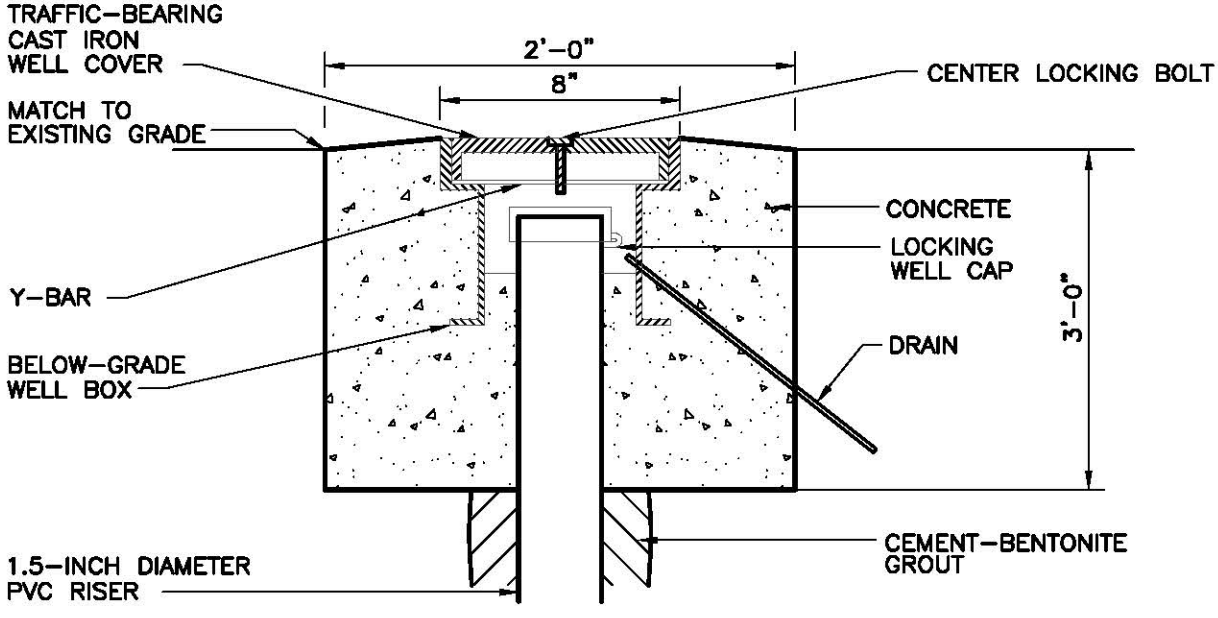
Additional Comments

Field Personnel _____ _____ ***Signature***

FIGURES



ABOVE GRADE WELLHEAD
CONSTRUCTION DETAIL – NOT TO SCALE



FLUSH TO GRADE WELLHEAD
CONSTRUCTION DETAIL – NOT TO SCALE

REFERENCES:

EPA, "RCRA GROUNDWATER MONITORING TECHNICAL ENFORCEMENT GUIDANCE DOCUMENT", OSWER 9950.1, SEPTEMBER 1986.

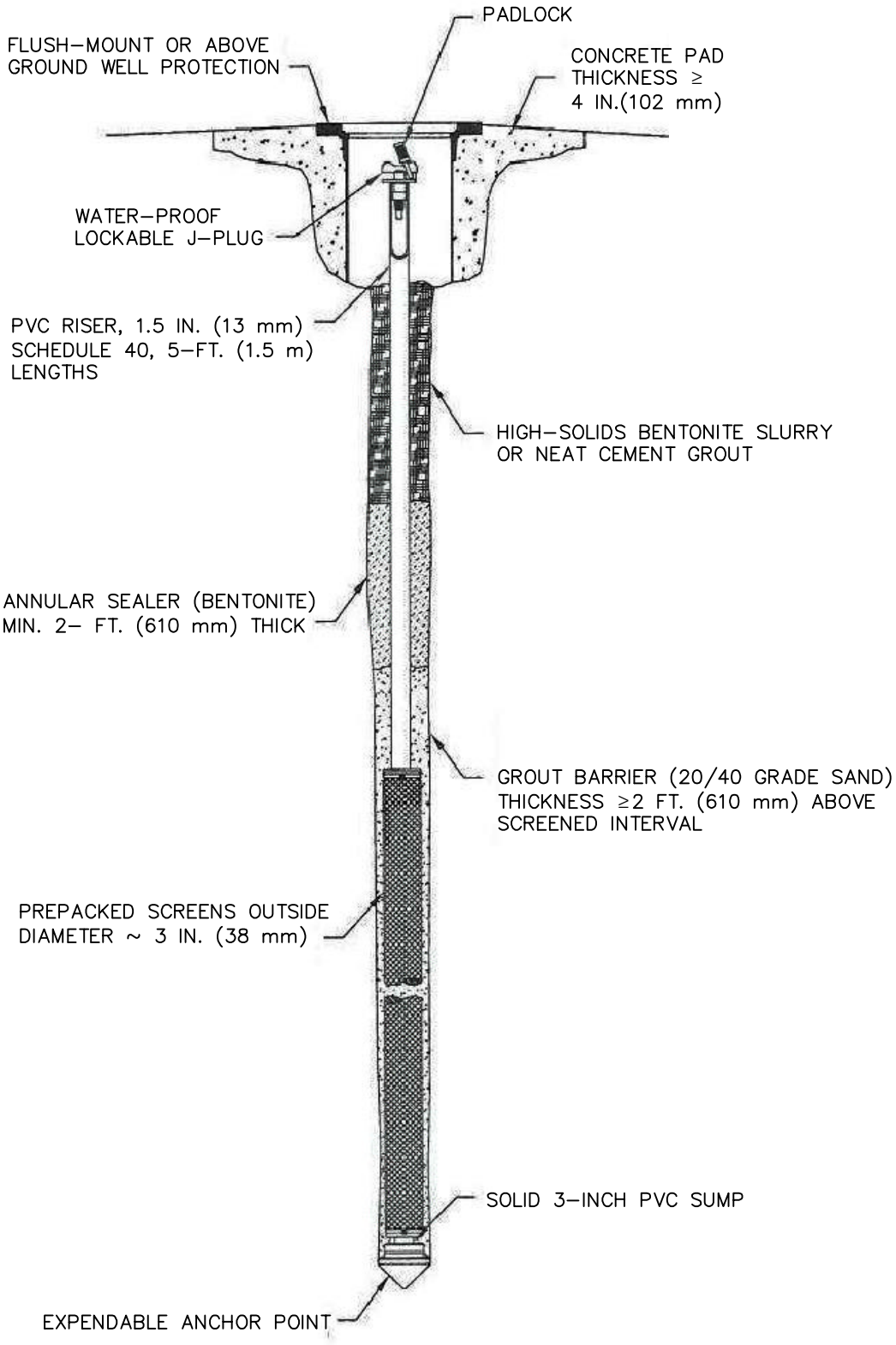
EPA, "HANDBOOK OF SUGGESTED PRACTICES FOR THE DESIGN AND INSTALLATION OF GROUNDWATER MONITORING WELLS", EPA/600/4–89/034, 1989.

LEA SOP for Installing & Developing Monitoring Wells & Piezometers

TYPICAL WELLHEAD DETAILS
Modified March 2008

Comm.No. 100

FIGURE 1



ADAPTED FROM "GEOPROBE ® SYSTEMS – THE COMPLETE PROBING SYSTEM", TECHNICAL BULLITEN 99250, AUG. 1999, REVISED DEC. 2002.

LEA SOP for Installing & Developing Monitoring Wells & Piezometers

COMPLETED PRE–PACKED SCREEN WELL

Modified March 2008

Comm.No.	
100	**FIGURE 2**

G:\AUTOCAD\PROJECTS\0000100\SOPS\PREPACK–SCREEN–WELL.DWG Tab:REV MARCH 2008 Saved: 3/5/2008 2:16 PM Plotted: 3/5/2008 2:20 PM

Loureiro Engineering Associates, Inc.
Standard Operating Procedure
for
Low-Flow (Low-Stress)
Liquid Sample Collection and Field Analysis

SOP ID: 10039
Date Initiated: 06/11/01
Revision No. 005: 04/01/12

Approved By: _____ *04/01/12*
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REVISION RECORD

Rev #	Date	Additions/Deletions/Modifications
Initial Issue	06/11/01	
001	04/01/02	Updated to reflect new SOP format.
002	12/02/02	Updated to reflect stabilization procedures.
003	04/01/05	Incorporated modified low-flow sampling procedure to include the use of a peristaltic pump.
004	08/09/11	Allowed use of plastic tub as secondary containment. Provided equation for standing water calculation. Required recording of depth of pump intake. Required direct calculation of flow rate. Minor wording changes to improve precision. Deleted reference since it has been rescinded: [Connecticut Department of Environmental Protection, Bureau of Water Management, Permitting Enforcement and Remediation Division. *Site Characterization Guidance Document*, Draft, June 12, 2000.]
005	04/01/12	Added unit conversion information from gallons to liters.

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Standard Operating Procedure
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Liquid Sample Collection and Field Analysis

1. Purpose and Scope

This standard operating procedure (SOP) describes the procedures to be followed for measurement of static water-level elevations, detection of immiscible layers, well evacuation, sample withdrawal, and field analyses utilizing low-flow sampling techniques.

2. Definitions

2.1. Immiscible layers: The term is used to denote separate-phase liquids that may be present in the aquifer as a result of a release. These liquids may have a density lighter than water (light non-aqueous phase liquids (LNAPL), which float) or heavier than water (dense non-aqueous phase liquids (DNAPL), which sink).

3. Equipment

3.1. Equipment required for the collection and field analysis of liquid samples shall include:

- Water-level indicator (accurate to 0.01 foot).
- Distilled water.
- Hand towels.
- Portable volatile organic compound (VOC) analyzer (Photovac MicroTIP®, Foxboro OVA® or equivalent).
- Interface probe/clear view bailer (to check for non-aqueous phase liquids, as appropriate).
- Flow-through cell capable of monitoring pH, temperature, specific-conductance, oxidation reduction potential (Eh), dissolved oxygen (DO), and turbidity.
- Polyethylene plastic sheeting and secondary containment units (plastic tubs).

- Adjustable rate peristaltic pump, bladder pump (constructed of stainless steel or Teflon®), adjustable rate submersible pump, or adjustable rate centrifugal pump. The bladder pump is preferable to the other two types of pumps.
- Appropriate tubing for the pump used, for instance polyethylene tubing (1/4 to 3/8 inch outer diameter [O.D.]) for the peristaltic pump
- Clean disposable gloves.
- Alconox®, or other non-phosphate, laboratory-grade detergent.
- Three 5-gallon buckets.
- Decontamination brushes.
- Distilled, de-ionized (DI) water.
- Decontamination fluids (less than 10 percent methanol in water, 100 percent n-hexane (as necessary), and 10 percent nitric acid).

4. Procedure

4.1. Health & Safety Requirements

All health and safety requirements described in the site-specific Health & Safety Plan and/or Job Hazard analysis shall be observed

4.2. Equipment Decontamination

All materials and equipment that enter a well must be clean and free of any potential contaminants. Do not use any contaminated equipment or materials which are not designed to be used for groundwater monitoring, even if this means that the sampling will not be performed as planned.

In general, the choice of decontamination procedures should be based upon knowledge of the site-specific contaminants and outlined in the site-specific work plan.

For sites at which the contaminants are unknown, but contamination is suspected, the decontamination procedures outlined below should be followed.

4.2.1. Prior to commencing any field activities, the following solutions (as appropriate for the appropriate contaminants) should be prepared and placed into 500-ml laboratory squirt bottles: less than 10 percent

methanol in water; 10 percent nitric acid in water; 100 percent n-hexane, as necessary; distilled, de-ionized water.

4.2.2. In the field, prepare approximately 2.5 gallons of a solution of Alconox® (or other suitable non-phosphate laboratory grade detergent) in tap water in a 5-gallon bucket.

4.2.3. Prepare a piece of 5-mil polyethylene sheeting to underlie the decontamination area. The sheeting should be of sufficient size to contain any accidental discharge of decontamination solutions. The plastic should be bermed to contain spills.

4.2.4. The order for decontaminating equipment is as follows:

1) Detergent scrub.
2) DI water rinse.
3) Hexane rinse (to be used only if separate-phase petroleum product, other than gasoline, is present).
4) DI water rinse.
5) 10 percent nitric acid rinse (to be used only when metals are suspected as potential contaminants).
6) DI water rinse.
7) Methanol rinse (less than 10 percent solution).
8) Air dry.

4.2.5. Materials such as the bailer cord should not be decontaminated and should just be disposed of after each test. Note: Bailers should be used **only** to check for LNAPL before sample collection using low-flow/low stress procedures. A bailer may be used to check for DNAPL only **after** all sample collection equipment has been removed from the well.

4.2.6. At the end of the project day, dispose of all spent decontamination fluids and materials such as the polyethylene sheeting and personal protective equipment in accordance with all applicable municipal, state, and federal regulations.

4.3. Sample Collection

4.3.1. Immediately upon opening the well, the air in the well head will be sampled for VOCs using a portable VOC analyzer, such as a Photovac MicroTIP® or equivalent. The instrument shall be zeroed with ambient air prior to the measurement, and the highest reading observed shall be

recorded for each well. Measurements should be taken until stabilization of the readings has occurred.

4.4. Detection of Immiscible Layers

4.4.1. Should evidence warrant, a sampling event shall include provisions for the detection of immiscible phases prior to well evacuation or sample collection. LNAPLs are relatively insoluble liquid organic compounds with densities less than that of water (1 g/ml), while DNAPLs are organic compounds with densities greater than that of water. Lighter and/or denser immiscible phases may be encountered in a groundwater monitoring well.

4.4.2. An interface probe will be used to determine the existence of any immiscible layers, light or dense. Alternatively, a clear fluorocarbon resin or PVC bailer may be used to determine the existence of the separate phases or oil sheen in the well when no accurate determination of the immiscible layer thickness is required. As noted above, efforts to detect LNAPL only can be performed prior to sample collection. Efforts to detect DNAPL can be performed only AFTER sample collection has occurred.

4.4.3. Should elevations of the immiscible layers be required, levels of the fluids shall be measured to an accuracy of 0.01 feet using an electronic interface probe capable of detecting the interfaces between air, product, and water. The interface levels shall be recorded on the field form. Adjustments of the observed head to the theoretical hydraulic head shall be calculated based on the density conversion factor associated with the particular non-aqueous phase liquid.

4.4.4. If LNAPL is detected in a well, collection of a groundwater sample from that well is not recommended unless otherwise specified in the site-specific work plan or work instruction. However, if a groundwater sample must be collected from that well, low-flow sampling is the recommended technique, although care must be taken to minimize mobilization of the LNAPL into the zone from which the sample will be collected. This is best accomplished by ensuring that the tubing or pump intake is placed well below the interface of the separate phase liquid with the water in the well.

4.5. Measurement of Static Water Level

4.5.1. The static water-level elevations in each well shall be measured prior to each sampling event. This is performed initially to characterize the site, and in subsequent sampling rounds to determine whether horizontal or vertical flow gradients have changed. A change in hydrologic conditions may necessitate modification of the groundwater monitoring program.

4.5.2. Remove the protective cover and locking cap from the well.

4.5.3. Make sure the well is properly labeled if there can be any question about the well I.D. based on location (i.e., more than one well in close proximity to each other). If the well cannot be clearly identified, either based on location or by a specific label of some kind on the well itself, clearly indicate that fact on the field sampling record, water-level measurement form, and/or field paperwork. A measurement of depth-to-bottom of the well can be made in an attempt to clarify the well I.D., but this should only be performed if the well will not be sampled for at least 12 hours in order to minimize any potential effects from disturbance of sediment that may have accumulated at the bottom of the well. Otherwise, a depth-to-bottom measurement can only be made after the well is sampled, as indicated in Section 4.5.5.

4.5.4. Each well shall have a surveyed reference point located at the top of the well casing with the locking cap removed. The reference point shall be easily recognizable, since the personnel conducting the sampling may differ from one sampling event to the next.

4.5.5. The following parameters shall be measured with an accuracy of 0.01 foot:

- Depth to standing water.
- Depth to bottom of well (after all liquid samples have been collected from the well).

4.5.6. A water-level indicator with a fiberglass tape will be used for measurement. As a result of possible pressure differences between the well atmosphere and the ambient atmosphere, the water level will be allowed fifteen minutes to equilibrate upon removal of the well cap. If excess pressure is encountered, the water level will be allowed greater than fifteen minutes to equilibrate upon removal of the well cap. The results shall be recorded on the appropriate field form(s).

4.5.7. Total depth measurements will be compared to original depths to determine the degree of siltation that may have occurred. This information shall be noted on the field forms. Should significant siltation occur in any well, the well shall be redeveloped by an approved method.

4.5.8. The portion of the tape immersed in the well shall be decontaminated during retrieval using a distilled water rinse followed by drying with a clean wipe, prior to use in another well. This decontamination procedure shall be amended, as needed, to accommodate the specific type of contamination anticipated.

4.5.9. The static water level should be monitored and recorded throughout the purging and sampling of each well.

4.6. Field Analysis

4.6.1. Parameters that are physically or chemically unstable shall be measured using probes that are inside a flow-through cell. Such parameters as pH, temperature, specific conductance, DO, Eh, and turbidity will be measured in the field at the temperature of the well sample.

4.6.2. Parameters such as pH, temperature, specific conductance, DO, and Eh shall be measured using a flow-through-cell (YSI model 6820 or equivalent). The meter shall be calibrated prior to use and at the end of the day using supplied solutions in accordance with the instructions provided by the manufacturer. Calibration information will be recorded in the field before and after each calibration.

4.5.3 Turbidity can be measured with a separate turbidimeter, although some flow-through cells include a turbidimeter. It is useful to have a separate turbidimeter on hand to check the validity of the turbidity values obtained using the flow-through cell if there is difficulty reaching low turbidity values or if the turbidity readings recorded do not seem to be consistent with visual observation of the water samples. All samples, including turbidity samples and samples to be submitted for analysis, must be collected before the groundwater passes through the flow-through cell to prevent cross-contamination by potentially stagnant fluid within the flow-through cell. This can be accomplished by using a bypass assembly or disconnecting the tubing from the flow-cell inlet prior to sampling.

4.7. Well Evacuation

4.7.1. Calculate the volume of the standing water in the well based on the following information and record on the appropriate field form:

Well Diameter (inches)	Conversion Factor (gallons/foot)	Conversion Factor (liter/foot)
2	0.163	0.617
4	0.654	2.48
6	1.47	5.56

Alternatively, the volume of standing water in the well can be calculated using the equation noted below, with the measurement of the well radius (r) in inches:

$$3.14 \times (r/12)^2 \times 7.48 = \text{gallons per foot of standing water}$$

$$3.14 \times (r/12)^2 \times 28.3 = \text{liters per foot of standing water}$$

The total volume of water in the well using this equation or the above information is determined by multiplying the value calculated or indicated by the depth of standing water in the well.

4.7.2. Generally, a peristaltic pump, bladder, submersible, or air-lift pump equipped with appropriate tubing of inert materials (such as polyethylene), shall be used to evacuate the monitoring wells.

4.7.3. A new piece of polyethylene plastic shall be placed on the ground adjacent to the well. Sampling and purging equipment such as the pump, tubing, containers, etc., shall be placed on the polyethylene sheet and/or a plastic secondary containment unit, never on the ground.

4.7.4. The pumps and tubing shall be prepared for insertion into the well while wearing disposable gloves. Make sure that any tubing or pump apparatus is of sufficient length to reach the appropriate depth for pumping.

4.7.5. Lower the pump and/or tubing gently into the water column to the midpoint of the saturated portion of the screened interval, unless otherwise specified. A site-specific sampling plan may specify a specific sampling depth, or provide specific criteria for the selection of intake depth for each well, but as a default, the tubing/intake should be placed at the midpoint of the saturated portion of the screen. **Record the actual depth at which the tubing/intake is placed.** If the saturated portion of the screen is less than 3 feet, the tubing or pump intake should be placed no closer than 1 foot from the bottom of the well. If the column of water in the well is less than 6 inches, serious consideration must be given to sampling the well, since it is not clear that the water in the well will be representative of water in the aquifer. If samples are collected from a well under these conditions, the limited volume of water should be specifically noted in the field paperwork.

Start the pump at the lowest speed setting and slowly increase the speed until discharge occurs. The initial pumping rate shall be approximately 0.1 liters per minute, however, the pumping rate shall not exceed 0.25 liters per minute. Measure the water level to ensure that drawdown in excess of 0.3 feet does not occur in the well. Adjust the pumping rate as necessary until little or no drawdown occurs. At least one actual measurement of the pumping rate should be conducted once drawdown stabilizes. That measurement should be made using a suitable measurement device for the volume anticipated over a measurement period of at least 20 to 30 seconds. Record the actual pumping rate on the field sampling record.

If the drawdown exceeds 0.3 feet, reduce pumping rate if possible. If drawdown still does not stabilize at a depth above the pump intake, shut the pump down and allow the well to recharge. It should be noted that a stable drawdown of approximately 0.3 feet is desirable but not mandatory. Stabilization of the drawdown at a depth greater than 0.3 feet is acceptable, as long as the depth at which stabilization occurs is above the pump intake. However, it is important that the stabilization depth is clearly recorded and maintained.

4.7.6. Monitor and record the water level and pumping rate at a minimum of every three to five minutes during purging. Calculate the volume of the discharge tubing, bladder pump (if used), and the flow-through cell. Monitor and record indicator field parameters (turbidity, pH, Eh, DO, temperature and specific conductance) in the well from the first water extracted during the purging process and at least every three to

five minutes thereafter. Stabilization is considered to be achieved when three consecutive readings are within the following limits and no increasing or decreasing trend in the data can be observed:

- Turbidity (10% for values less than 5 and greater than 1 NTU). It should be noted that achievements of turbidity levels less than 5 NTUs are not mandatory but efforts should be made to collect a groundwater samples with the lowest turbidity achievable.
- DO (10%, measured as milligrams per liter).
- Specific Conductance and Temperature (3%).
- pH (+/- 0.1 unit).
- ORP/Eh (+/- 10 millivolts).

4.7.7. If after 2 hours of purging or the purging of three well volumes, (whichever comes first) the field parameters have not stabilized, purging may be discontinued to allow sample collection. Similarly, if it is not possible to obtain stabilization as described above as a result of slow recovery of the well, the well shall be evacuated and allowed to recover, at which point the samples should be collected immediately. The appropriate sampling forms shall include a notation that sample collection occurred without stabilization. Samples obtained from slow-yielding wells shall be collected as soon as a sufficient volume is available for a sample for each parameter.

4.7.8. Do **not** re-use purging equipment. Pumps shall be decontaminated between monitoring wells, in accordance with procedures noted in Section 4.1.

4.7.9. Record sampler's name, sampling time, volume of water purged, parameters measured, weather conditions, sample number, analyses required and all other pertinent information in the field notebook and/or appropriate field forms, and complete the chain of custody form.

4.7.10. Any water purged from the monitoring wells shall be stored in appropriate containers until the laboratory analyses are available. Then it should be disposed of in accordance with all applicable local, state and federal requirements.

4.7.11. Storage shall be in containers approved for storage of hazardous materials and in an appropriate designated location at the facility.

4.8. Sample Withdrawal

4.8.1. In order to ensure that the groundwater sample is representative of the formation, it is important to minimize physical alteration (i.e. agitation during purging and/or sample collection) or chemical contamination of the sample during the withdrawal process.

4.8.2. Use an appropriate pump to purge each well; the same pump used for purging shall be used for sample withdrawal.

4.8.3. The samples shall be collected at a location before entering the flow-through cell. To minimize the effects of water column agitation on sample quality, samples shall be collected from the pump tubing in the following order into pre-labeled sample containers:

- VOCs.
- Total petroleum hydrocarbons.
- Extractable organics (semivolatiles).
- PCBs.
- Metals.
- Phenols.
- Cyanide.
- Chloride and sulfate.
- Nitrate and ammonia.
- Turbidity.
- Radionuclides.
- Purgeable organic carbon (POCs).
- Purgeable organic halogens (POX).
- Total organic halogens (TOX).
- Total organic carbon (TOC).

4.8.4. Samples shall be obtained from the monitoring wells as soon as possible after purging. This may require waiting an extended period for low-yielding wells.

4.8.5. Samples collected for VOC analysis shall be free of any air bubbles and inverted upon filling. Bacterial samples shall be collected using dedicated gloves; taking care not to allow anything to touch the inside of the sampling container.

4.8.6. Samples collected for metals analysis, which are to be filtered in the field, shall be passed through an appropriately sized filter prior to placement in the sample bottle. Pre-rinse the filter with approximately 25 to 50 milliliters of groundwater prior to collecting the samples for filtered metals analyses. Filter sizes will generally be either 10 microns for metals that could be present as colloids or adsorbed onto colloids that could be mobile in the aquifer or 0.45 microns for dissolved metals. The appropriate filter size for the individual project must be provided in site-specific work instructions.

4.9. "What If" Scenarios

4.9.1. Certain field conditions may be encountered that influence the choice of equipment to be used or altogether limit the feasibility of low-flow sampling techniques. The following is a brief description of select scenarios to provide field personnel with a guideline if similar circumstances are encountered

4.9.2. Turbidity

4.9.2.1. If turbidity measurements do not stabilize as described above after 2 hours of purging or the evacuation of three well volumes, whichever comes first, sample collection can be initiated. Record observations of the color, clarity, and other observable characteristics of the groundwater (such as the presence or absence of particles) in the field paperwork

4.9.2.2. If samples are being collected for analysis for total (unfiltered) metals and the turbidity has not stabilized below 10 NTU, a sample for additional analysis for metals should also be collected after being filtered in the field through an in-line 10-micron filter, if specified in the work instructions.

4.9.3. Peristaltic Pump

4.9.3.1. Difficulty may be encountered while advancing the flexible polyethylene peristaltic pump tubing to the desired depth within a deep well or older well. Excessive friction may result from the tubing contacting the sidewall of the well casing or accumulations of material on the well casing (i.e. mineral and bacterial deposits). In these scenarios, the tubing may coil within the well during advancement and prevent the desired depth from being attained. Efforts to weight the tubing should be attempted before using alternate pumping techniques.

4.9.3.2. If such well conditions are expected, a bladder pump or other submersible pump should be used instead of a peristaltic pump. A bladder pump provides sufficient mass on the tubing to allow for advancement in deep or older wells.

4.9.3.3. A peristaltic pump cannot be used to sample wells in which the depth to water is greater than approximately 25 to 30 feet.

4.9.4. Sampling Depth

4.9.4.1. If conditions exist that prevent the appropriate pump or tubing from being advanced to the midpoint of the saturated portion of the screened interval, low-flow sampling techniques shall not be used. Instead, sampling shall be conducted using conventional purging and sampling techniques, as described in LEA SOP 10004 entitled *Liquid Sample Collection and Field Analysis*. Justification for not using low-flow sampling techniques must be provided in the field paperwork.

4.10. Field Documentation

4.10.1. Field documentation shall include at a minimum: a chain-of-custody form, Field Data Record Groundwater Form, Sample Collection Form, Daily Field Report. Sample labels and sample seals shall be used for proper sample identification.

4.10.1.1. The labels shall be sufficiently durable to withstand immersion for 48 hours without detaching and to withstand

normal handling. The information provided shall be legible at all times.

4.10.1.2. The following information shall be provided on the sample label using an indelible pen:

- Sample identification number.
- Date and time of collection.
- Place of collection.
- Parameter(s) requested (if space permits).

4.10.1.3. Appropriate field forms will be used to log all pertinent information with an indelible pen. The following information shall be provided:

- Project and site identification.
- LEA commission number.
- Identification of well.
- Static water level measurement technique.
- Presence of immiscible layers and detection method.
- Time well purged.
- Collection method for immiscible layers and sample identification numbers.
- Well evacuation procedure/equipment.
- Sample withdrawal procedure/equipment.
- Date and time of collection.
- Types of sample containers used and sample identification numbers.
- Preservative(s) used.
- Parameters requested for analysis.
- Field analysis method(s).
- Whether or not field filtration was performed and the filter size, if appropriate.
- Field observations on day of sampling event.

- Record of site activities.
- Field personnel.
- Climatic conditions, including air temperature.
- Status of total production.
- Record of non-productive time.

4.10.1.4. The Field Sampling Record shall include at a minimum the following information:

- Identification of well.
- Date and time of collection.
- Name of collector.
- Sample number.

4.10.1.5. The chain-of-custody record shall include the following information:

- Company's name and location.
- Date and time of collection.
- Sample number.
- Container type, number, size.
- Preservative used.
- Signature of collector.
- Signatures of persons involved in the chain of possession.
- Analyses to be performed.
- Type and number of samples.

4.10.1.6. The Field Data Record Groundwater Form shall be updated during the sampling of each well and include the following information:

- Identification of well.
- Well depth, diameter, depth to water.
- Static water level depth and measurement technique.

- Purge volume and pumping rate.
- Time well is purged.
- Measurements of initial field parameters and all subsequent readings.
- Any specific circumstances, as described above, such as field filtering, lack of stabilization of parameters, water characteristics, etc.
- LEA commission number.
- Date.
- Depth of pump intake or tubing intake

4.10.1.7. The Daily Field Record shall include the following information:

- Client's name, location, LEA commission number, date.
- Instrument make, model, and type.
- Calibration readings.
- Calibration/filtration lot numbers.
- Field personnel and signature.

4.10.1.8. The Daily Field Record shall assure the completeness of the sampling round and include the following information:

- Reviewer's name, date, and LEA commission number.
- Review of all necessary site activities and field forms.
- Statement of corrective actions for deficiencies.

5. References

5.1. United States Environmental Protection Agency (EPA), Region I. *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells,* July 30, 1996, Revision 2.

5.2. EPA. *Groundwater Sampling Guidelines for Superfund and RCRA Project Managers – Groundwater Forum Issue Paper,* Office of Solid Waste and Emergency Response, (EPA 542-S-02-001), May 2002.

5.3. Robert W. Puls and Michael Barcelona, EPA. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures,* in Groundwater Issue, (EPA/540/S-95/504), April 1996.

END OF DOCUMENT

ATTACHMENT E-2

Performance Evaluation Sample Results

RESULTS OF PERFORMANCE SAMPLE EVALUATION

Pratt & Whitney, East Hartford, Connecticut: Willow Pond

Loureiro
Engineering • Construction • EH&S • Energy • Waste

Location Identifier: Performance
Sample Identifier 1266371 09/27/2012 08:57 Performance Evaluation, Water

Chemical Name	Reported Concentration	Qualifiers	R.L.	M.D.L.	Units	Dil.	Lab.	Lab. Number	Reference	Upper Limit	Lower Limit	Result
1,1,1,2-Tetrachloroethane	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,1,1-Trichloroethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
1,1,2,2-Tetrachloroethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
1,1,2-Trichloroethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
1,1,2-Trichlorotrifluoroethane	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,1-Dichloroethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
1,1-Dichloroethylene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
1,1-Dichloropropene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,2,3-Trichlorobenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,2,3-Trichloropropane	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,2,4-Trichlorobenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,2,4-Trimethylbenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,2-Dibromo-3-Chloropropane	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,2-Dichloroethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
1,2-Dichloropropane	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				
1,3,5-Trimethylbenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
1,3-Dichloropropane	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
2-Hexanone	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
4-Isopropyltoluene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Acetone	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Acrylonitrile	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Benzene	ND<0.50	U	0.50	0.50	ug/L	1	ACTM	MC14490-3				
Bromobenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Bromodichloromethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Bromoform	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Bromomethane	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				
Butyl Benzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Carbon Disulfide	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Carbon Tetrachloride	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Chlorobenzene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Chlorodibromomethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Chloroethane	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				
Chloroform	2.6		1.0		ug/L	1	ACTM	MC14490-3				FALSE POSITIVE
Chloromethane	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				
Dichlorodifluoromethane	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				

RESULTS OF PERFORMANCE SAMPLE EVALUATION

Pratt & Whitney, East Hartford, Connecticut: Willow Pond

Loureiro
Engineering • Construction • EH&S • Energy • Waste

Ethylbenzene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Ethylene Dibromide	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				
Hexachlorobutadiene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Isopropylbenzene (Cumene)	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Methyl Ethyl ketone	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Methyl Isobutyl ketone	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Methyl tert-Butyl ether	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Methylene Chloride	ND<2.0	U	2.0	2.0	ug/L	1	ACTM	MC14490-3				
Methylene Dibromide	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Naphthalene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Propylbenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Styrene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
Tetrachloroethylene	142		1.0		ug/L	1	ACTM	MC14490-3	62.0	74.2	39.1	FAIL
Tetrahydrofuran	ND<10	U	10	10	ug/L	1	ACTM	MC14490-3				
Toluene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Trichloroethylene	288		25		ug/L	25	ACTM	MC14490-3	92.0	110	68.0	FAIL
Trichlorofluoromethane	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
Vinyl Chloride	327		1.0		ug/L	1	ACTM	MC14490-3	34.0	51.0	19.9	FAIL
Xylenes,m- & p-	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
cis-1,2-Dichloroethylene	349		25		ug/L	25	ACTM	MC14490-3	84.8	104	66.7	FAIL
cis-1,3-Dichloropropene	ND<0.50	U	0.50	0.50	ug/L	1	ACTM	MC14490-3				
m-Dichlorobenzene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
o-Chlorotoluene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
o-Dichlorobenzene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
o-Xylene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
p-Chlorotoluene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
p-Dichlorobenzene	ND<1.0	U	1.0	1.0	ug/L	1	ACTM	MC14490-3				
sec-Butylbenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
sec-Dichloropropane	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
tert-Butylbenzene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				
trans-1,2-Dichloroethylene	228		1.0		ug/L	1	ACTM	MC14490-3	98.1	124	73.8	FAIL
trans-1,3-Dichloropropene	ND<0.50	U	0.50	0.50	ug/L	1	ACTM	MC14490-3				
trans-1,4-Dichlorobutene	ND<5.0	U	5.0	5.0	ug/L	1	ACTM	MC14490-3				

Location Identifier: Performance
Sample Identifier 1266372 09/27/2012 09:00 Performance Evaluation, Water

Chemical Name	Reported Concentration	Qualifiers	R.L.	M.D.L.	Units	Dil.	Lab.	Lab. Number	Reference	Upper Limit	Lower Limit	Result
Arsenic (unfiltered)	0.0067		0.0040	0.00099	mg/L	1	ACTM	MC14490-4	0.00700	0.00769	0.00605	Pass
Barium (unfiltered)	0.388		0.05	0.00028	mg/L	1	ACTM	MC14490-4	0.400	0.435	0.364	Pass

Cadmium (unfiltered)	0.0937		0.0040	0.00019	mg/L	1	ACTM	MC14490-4	0.100	0.106	0.0877	Pass
Chromium, Total (unfiltered)	0.2		0.01	0.0006	mg/L	1	ACTM	MC14490-4	0.200	0.218	0.182	Pass
Copper (unfiltered)	0.0396		0.025	0.00085	mg/L	1	ACTM	MC14490-4	0.0400	0.0436	0.0360	Pass
Lead (unfiltered)	ND<0.0050	U	0.0050	0.0013	mg/L	1	ACTM	MC14490-4				
Mercury (unfiltered)	ND<0.00020	U	0.00020	0.000011	mg/L	1	ACTM	MC14490-4				
Nickel (unfiltered)	0.581		0.04	0.00025	mg/L	1	ACTM	MC14490-4	0.600	0.657	0.544	Pass
Selenium (unfiltered)	ND<0.01	U	0.01	0.0014	mg/L	1	ACTM	MC14490-4				
Silver (unfiltered)	ND<0.0050	U	0.0050	0.00069	mg/L	1	ACTM	MC14490-4				
Zinc (unfiltered)	0.0300		0.02	0.00033	mg/L	1	ACTM	MC14490-4	0.0300	0.0331	0.0272	Pass

Location Identifier: Performance
Sample Identifier 1266373 09/27/2012 09:45 Performance Evaluation, Water

Chemical Name	Reported Concentration	Qualifiers	R.L.	M.D.L.	Units	Dil.	Lab.	Lab. Number	Reference	Upper Limit	Lower Limit	Result
Arochlor 1016	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1221	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1232	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1242	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1248	1.0		0.25		ug/L	1	ACTM	MC14490-5	1.29	1.77	0.669	Pass
Arochlor 1254	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1260	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1262	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				
Arochlor 1268	ND<0.25	U	0.25	0.25	ug/L	1	ACTM	MC14490-5				

Location Identifier: Performance
Sample Identifier 1266374 09/27/2012 10:30 Performance Evaluation, Water

Chemical Name	Reported Concentration	Qualifiers	R.L.	M.D.L.	Units	Dil.	Lab.	Lab. Number	Reference	Upper Limit	Lower Limit	Result
Total Petroleum Hydrocarbons (CT ETPH)	0.706		0.080		mg/L	1	ACTM	MC14490-6	1.500	1.820	0.457	Pass

ATTACHMENT E-3

Data Quality Assessment Worksheets

DEEP Reasonable Confidence Protocol - Data Quality Assessment Worksheet

Project: PWCTEH:F & H Buildings Groundwater, East Hartford, CT
Commission #: 88UT136
Laboratory: Accutest
SDG: MC7631

Date Samples Collected: 1/31/2012

Note 1: Initial and continuing calibration QC non-conformances have been evaluated but are not included in the following DQA spreadsheet.
Note 2: Bias High: reported result may be lower, RLs are accepted as reported.
Bias Low: reported result may be higher, RLs may be higher.
Note 3: Only samples with QC non-conformances are included below.

Location ID	Depth	Sample Number / Lab Number	Batch ID/QC	Dilution	Parameter	Parameter Type	Outlier (%)	Low Limit	High Limit	Bias	Footnotes
HB-MW-05	NA	1249871UF (MC7631-1)			No QC Issues						

DEEP Reasonable Confidence Protocol - Data Quality Assessment Worksheet

Project: PWCTEH:F & H Buildings Groundwater, East Hartford, CT
Commission #: 88UT136
Laboratory: Accutest
SDG: MC13780

Date Samples Collected: 9/6/2012

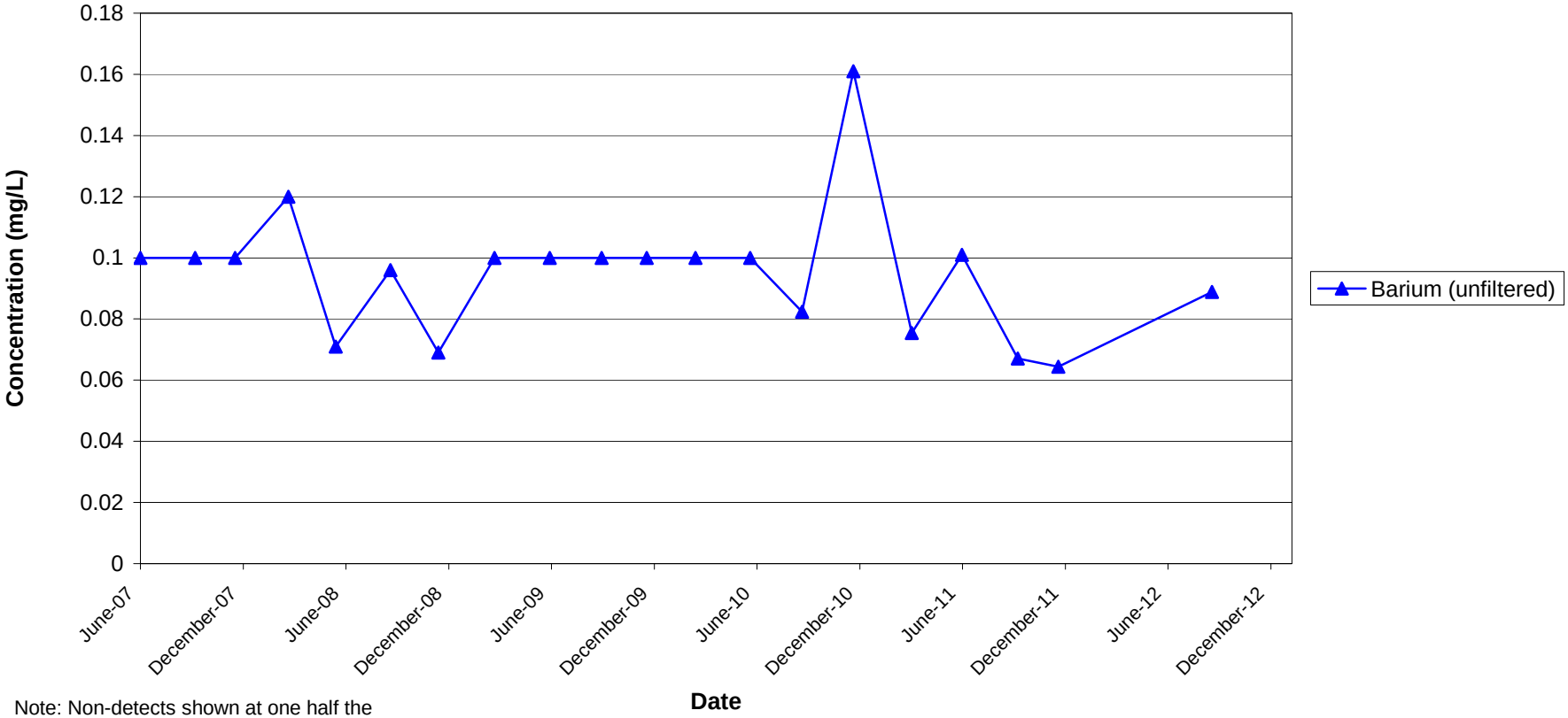
Note 1: Initial and continuing calibration QC non-conformances have been evaluated but are not included in the following DQA spreadsheet.
Note 2: Bias High: reported result may be lower, RLs are accepted as reported.
Bias Low: reported result may be higher, RLs may be higher.
Note 3: Only samples with QC non-conformances are included below.

Location ID	Depth	Sample Number / Lab Number	Batch ID/QC	Dilution	Parameter	Parameter Type	Outlier (%)	Low Limit	High Limit	Bias	Footnotes
EQUIPMENT	NA	1263258 (MC13780-2)	MC13780-2	1	All PCBs	SURR	23	30	150	Low	
EQUIPMENT	NA	1263258 (MC13780-2)	MSP2103-BS	1	1,2,4-Trichlorobenzene	REC	69	70	130	Low	
EQUIPMENT	NA	1263258 (MC13780-2)	MSP2103-BS	1	Trans-1,4-Dichloro-2-Butene	REC	50	70	130	Low	
EQUIPMENT	NA	1263258 (MC13780-2)	MSP2103-BS	1	Naphthalene	REC	50	70	130	Low	
EQUIPMENT	NA	1263258 (MC13780-2)	MSP2103-BS	1	2,2-Dichloropropane	REC	53	70	130	Low	
HB-MW-07	NA	1263255 (MC13780-4)	MSP2103-BS	1	1,2,4-Trichlorobenzene	REC	69	70	130	Low	
HB-MW-07	NA	1263255 (MC13780-4)	MSP2103-BS	1	Trans-1,4-Dichloro-2-Butene	REC	50	70	130	Low	
HB-MW-07	NA	1263255 (MC13780-4)	MSP2103-BS	1	Naphthalene	REC	50	70	130	Low	
HB-MW-07	NA	1263255 (MC13780-4)	MSP2103-BS	1	2,2-Dichloropropane	REC	53	70	130	Low	
HB-MW-08	NA	1263256 (MC13780-6)	MSP2103-BS	1	1,2,4-Trichlorobenzene	REC	69	70	130	Low	
HB-MW-08	NA	1263256 (MC13780-6)	MSP2103-BS	1	Trans-1,4-Dichloro-2-Butene	REC	50	70	130	Low	
HB-MW-08	NA	1263256 (MC13780-6)	MSP2103-BS	1	Naphthalene	REC	50	70	130	Low	
HB-MW-08	NA	1263256 (MC13780-6)	MSP2103-BS	1	2,2-Dichloropropane	REC	53	70	130	Low	
HB-MW-08	NA	1263257 (MC13780-8)	MSP2103-BS	1	1,2,4-Trichlorobenzene	REC	69	70	130	Low	
HB-MW-08	NA	1263257 (MC13780-8)	MSP2103-BS	1	Trans-1,4-Dichloro-2-Butene	REC	50	70	130	Low	
HB-MW-08	NA	1263257 (MC13780-8)	MSP2103-BS	1	Naphthalene	REC	50	70	130	Low	
HB-MW-08	NA	1263257 (MC13780-8)	MSP2103-BS	1	2,2-Dichloropropane	REC	53	70	130	Low	
TRIP BLANK	NA	1263259 (MC13780-1)	MSP2103-BS	1	1,2,4-Trichlorobenzene	REC	69	70	130	Low	
TRIP BLANK	NA	1263259 (MC13780-1)	MSP2103-BS	1	Trans-1,4-Dichloro-2-Butene	REC	50	70	130	Low	
TRIP BLANK	NA	1263259 (MC13780-1)	MSP2103-BS	1	Naphthalene	REC	50	70	130	Low	
TRIP BLANK	NA	1263259 (MC13780-1)	MSP2103-BS	1	2,2-Dichloropropane	REC	53	70	130	Low	

Appendix F

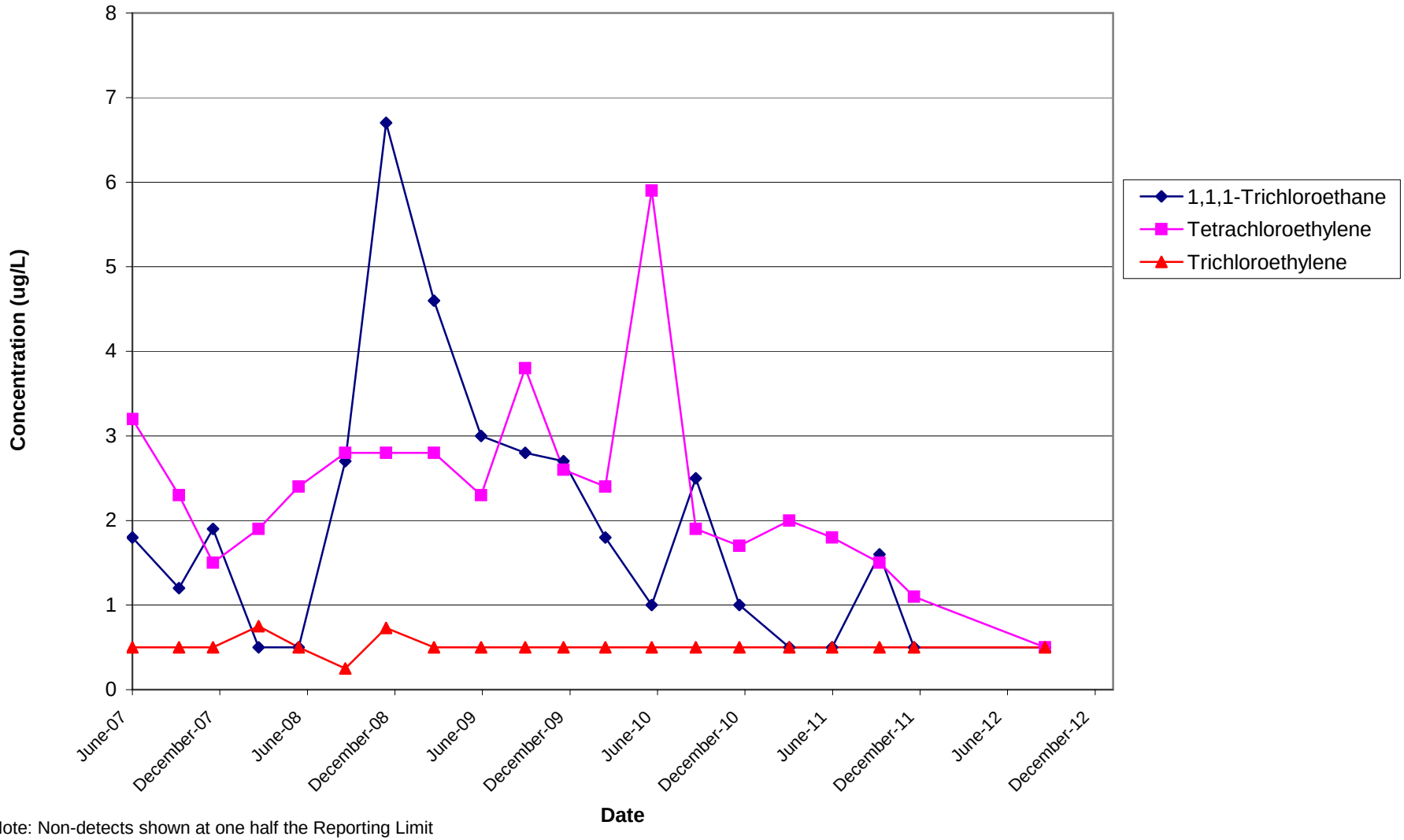
Select Constituent Concentration Graphs for HB-MW-07

HB-MW-07 - Barium (Unfiltered)
Pratt & Whitney, East Hartford, Connecticut: F and H Buildings 2012 Annual Groundwater Monitoring Report



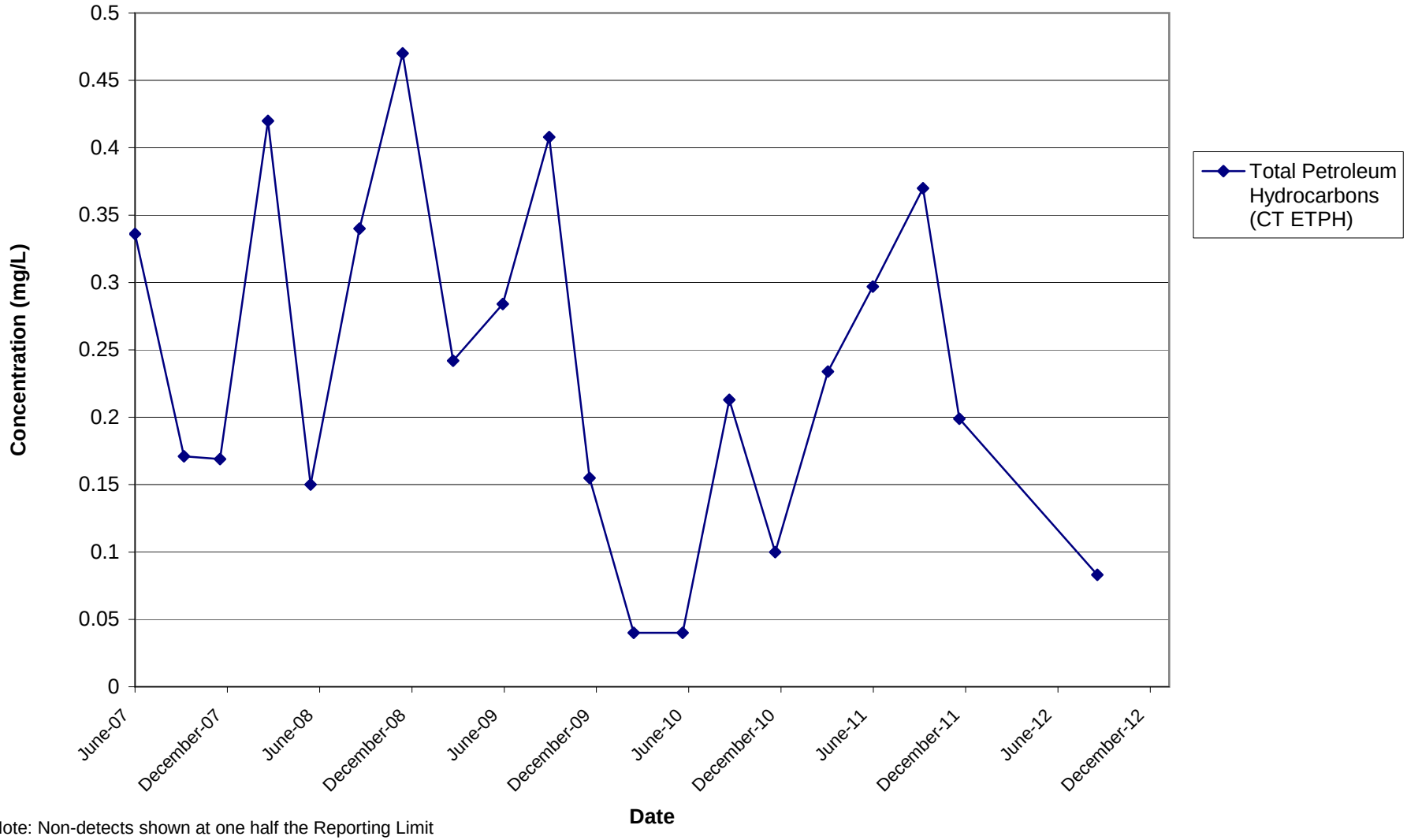
Note: Non-detects shown at one half the Reporting Limit

HB-MW-07 - Select Volatile Organic Compounds
Pratt & Whitney, East Hartford, Connecticut: F and H Buildings 2012 Annual Groundwater Monitoring Report



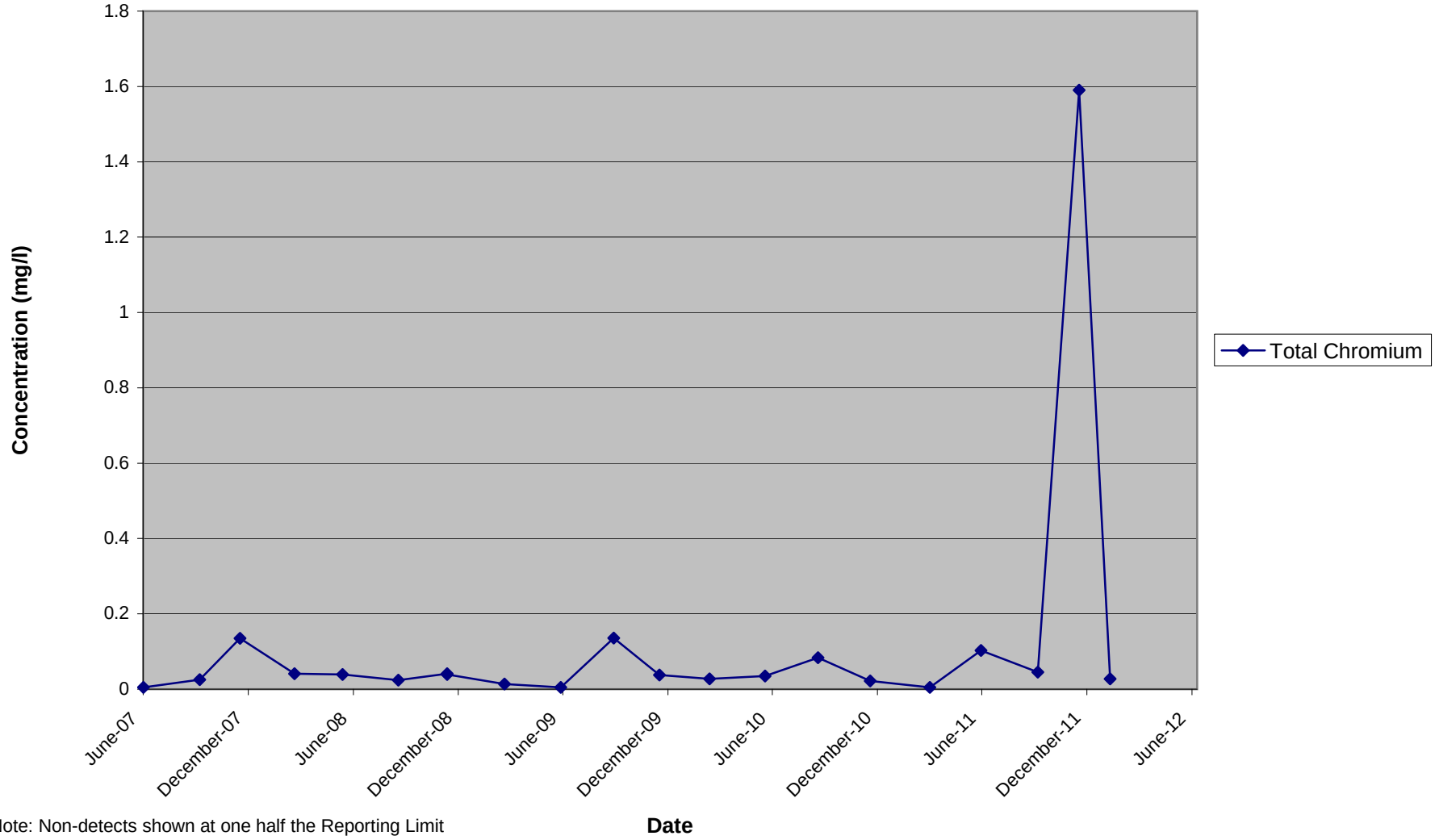
Note: Non-detects shown at one half the Reporting Limit

HB-MW-07 - Total Petroleum Hydrocarbons
Pratt & Whitney, East Hartford, Connecticut: F and H Buildings 2012 Annual Groundwater Monitoring Report



Note: Non-detects shown at one half the Reporting Limit

HB-MW-05 - Total Chromium
Pratt & Whitney, East Hartford, Connecticut: F and H Buildings 2012 Annual Groundwater Monitoring Report



Note: Non-detects shown at one half the Reporting Limit

Appendix G

Post-Remediation Maintenance Monitoring Forms

United Technologies/Pratt & Whitney
2012 Post-Remediation Maintenance and Monitoring Program
F&H Buildings

Weather Conditions: Sunny/windy
Inspection Date: 3-26-2012
Inspection Time: 1400

Inspector: [signature]
Reviewed By: R. McKinney

INSPECTION POINT	DESCRIPTION	GOOD	FAIR	POOR
1) Signs of erosion over engineered control	Check for gullies.	✓		
2) Signs of settling over engineered control	Look for ponding and for settling of pavement of more than 0.5 inches over a 5 square foot area.	✓		
3) Signs of ponding over engineered control	Look for areas of more than 5 square feet of standing water.	✓		
4) Signs of pavement damage over engineered control and pavement used to render soil inaccessible	Look for areas of spider cracking, spalling and loss of binder.	(RM) ✓	✓ - Same condition as noted in 2011. (RM)	
5) Permanent Survey Markers	Look for damaged or missing markers.	✓		
6) Monitoring well network	Check concrete collar protective casing, locks, legible well identification.	✓		
	1.Condition of lock	✓		
	2.Visible ID of wells		✓ - adequate marking (RM)	
	3.Ponding or infiltration of surface water	✓		
	4.Condition of concrete collar	✓		
	5.Condition of steel casing	N/A		

Report all deficiencies to the designated representative of United Technologies Corporation/Pratt & Whitney
List all deficiencies, the corrective measures taken, and the date corrective measures were completed:

1) Cracks observed in asphalt.

Corrective Action: Coordinating w/ P&W to repair cracks. (RM)

2) _____

Corrective Action: _____

3) _____

Corrective Action: _____

4) _____

Corrective Action: _____

United Technologies/Pratt & Whitney
2012 Post-Remediation Maintenance and Monitoring Program
F&H Buildings

Weather Conditions: Sunny 75°
Inspection Date: 9/12/12
Inspection Time: 9:30 am

Inspector: Nate Emmons
Reviewed By: R. McKinney

INSPECTION POINT	DESCRIPTION	GOOD	FAIR	POOR
1) Signs of erosion over engineered control	Check for gullies.	✓		
2) Signs of settling over engineered control	Look for ponding and for settling of pavement of more than 0.5 inches over a 5 square foot area.	✓		
3) Signs of ponding over engineered control	Look for areas of more than 5 square feet of standing water.	✓		
4) Signs of pavement damage over engineered control and pavement used to render soil inaccessible	Look for areas of spider cracking, spalling and loss of binder.	✓		
5) Permanent Survey Markers	Look for damaged or missing markers.	✓		
6) Monitoring well network	Check concrete collar protective casing, locks, legible well identification.			
	1.Condition of lock			conducted during sampling event on 9/6/12 (RM)
	2.Visible ID of wells		///	
	3.Ponding or infiltration of surface water			
	4.Condition of concrete collar			
	5.Condition of steel casing			

Report all deficiencies to the designated representative of United Technologies Corporation/Pratt & Whitney
List all deficiencies, the corrective measures taken, and the date corrective measures were completed:

1) The engineered control is in good shape

Corrective Action: None (RM)

2) HB-MW-04 has been paved over. (RM)

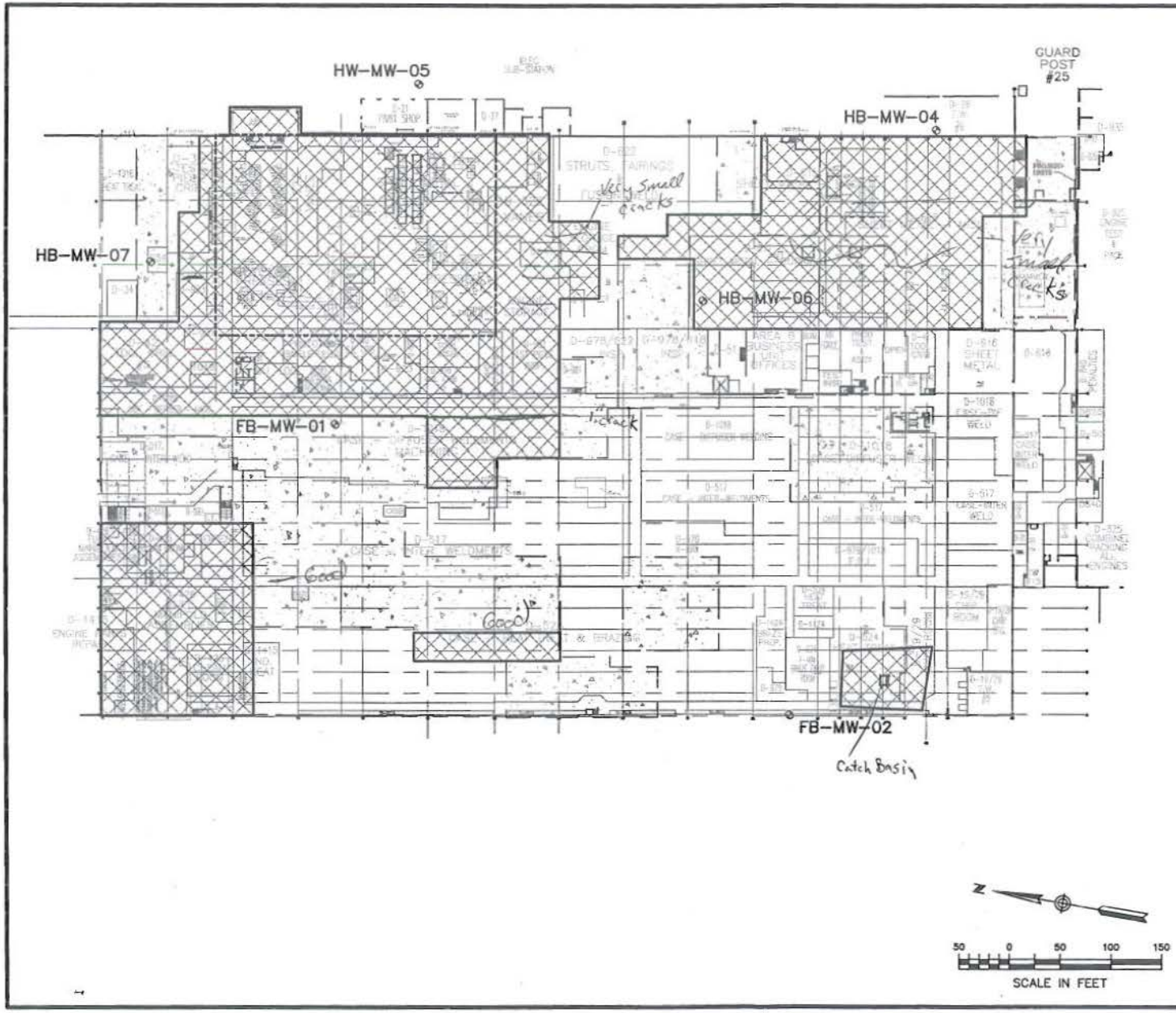
Corrective Action: Well is no longer included in ~~monitoring~~ well network of wells to be sampled. No action is required. (RM)

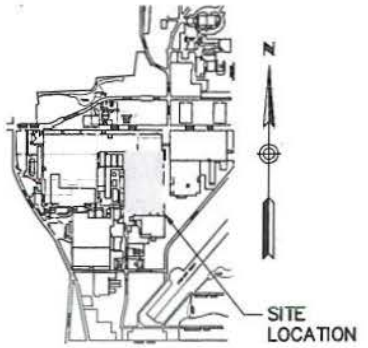
3) _____

Corrective Action: _____

4) _____

Corrective Action: _____





KEY MAP
NOT TO SCALE

LEGEND

- APPROXIMATE LIMITS OF BITUMINOUS ASPHALT
- APPROXIMATE LIMITS OF PREVIOUS CONCRETE REMOVAL & REPLACED WITH PROCESSED AGGREGATE BASE
- APPROXIMATE LIMITS OF ENGINEERED CONTROL
- MONITORING WELL LOCATION

Cap Inspection observations made by ME on 9/12/12. (M)

2010 ANNUAL POST-REMEDIATION MAINTENANCE AND GROUNDWATER MONITORING REPORT
PRATT & WHITNEY DIVISION, F&H BUILDINGS, EAST HARTFORD, CONNECTICUT

SITE PLAN

Comm.No.	FIGURE 4-1	LEA
88UT045		